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# IMPERIAL BUREAU OF FRUIT PRODUCTION

## HORTICULTURAL ABSTRACTS

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# HORTICULTURAL ABSTRACTS

## VOLUME II

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KENT, ENGLAND



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## HORTICULTURAL ABSTRACTS.

VOL. 2.

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No. 1.

**Indexing.** The appropriate numbers of the Brussels International Decimal Classification are given at the head of each abstract.

**Bibliographical Headings.** In response to suggestions from readers a change in type has been made, the English titles being set out more prominently.

**Criticism.** It is hoped that readers will continue to make suggestions tending to promote the usefulness of Horticultural Abstracts.

**Abstracts.** Initialled abstracts in the present number are by T. N. Hoblyn and H. M. Tydeman, the remainder being by the Bureau staff.

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# Horticultural Abstracts

Vol. II

March, 1932

No. 1

## HORTICULTURE—MISCELLANEOUS.

1. ANON. 634.1/7(064)

**The Imperial Fruit Show, 1931.**

*J. Min. Agr.*, 1931, 38 : 895-8.

An account of the chief features of this show, including details of the more important fruit exhibits from different parts of the Empire and the economic and educational exhibits of the Ministry of Agriculture and of the chief research stations concerned with fruit and fruit products in the U.K.

2. BECKETT, W. H. 519.24 : 581.084.2

**Field experiments. A note on the residual variance in field experiments.**

*Trop. Agriculture*, 1931, 9 : 7-10, bibl. 5.

This note is intended for students who are already familiar with the construction and arithmetical analysis of such modern methods of lay-out as the latin square, and who desire to go a stage further in the mathematics. It is pointed out that the total variance in an experiment is partitioned out into its component parts, e.g. those parts due to differences between rows, columns, treatments and the residual part which is due to the errors of the experiment. It is shown that this last is a definite part of the total variance, which can be obtained directly from the data as well as by the more common method of calculating the total variance and subtracting therefrom those parts due to treatment and position. Two methods of calculating the residual variance of a  $4 \times 4$  latin square are given as examples.

T.N.H.

3. TINCKER, M. A. H. 631.588.2

**Some experiments with ultra-violet ray glasses: and Experiments with ultra-violet ray glass II.**

*J. Roy. Hort. Soc.*, 1930, 55 : 79-87, bibl. 12, and *ibidem* 1932, 57 : 51-7, bibl. 16.

In the first article the author gives the results of his experiments with radishes, lettuce, cucumbers and carrots, grown from seed in frames at different times of the year under ordinary glass, under Vioray glass and under Vitaglass. In the second are given data obtained in later experiments with Vitaglass and ordinary glass on radishes, lettuces and cucumbers grown in 1930



and 1931. Figures are given of fresh and dry weight of plants, differentiating between tops and roots in the case of carrots and radishes. An interesting survey is made of previous work on the subject. The author concludes that the effect of growing under glass which transmits ultraviolet rays probably varies with the species. In several instances an increase in crop of more than 10 per cent. and an increased ratio of root to shoot have been obtained by its use with carrots, radishes and other rootcrops. With lettuce results have been contradictory. With other crops a slightly reduced yield has been reported and slight leaf scorching observed. In many instances the temperature under the ultra glass has been higher, due partly, if not entirely, to the different thickness of the glass. Such temperature differences have no doubt been responsible for part of the observed differences in the growth of the plants.

4. SMITH, A. 631.589  
**Effect of paper mulches on soil temperature, soil moisture and yields of certain crops.**

*Hilgardia*, 1931, 6 : 6 : 159-201, bibl. 17.

The writer, discussing the results of other workers, notes that the most general use of mulch paper at present is in the Hawaiian pineapple industry, where an asphalt-impregnated, non-perforated black paper is used and ammonium sulphate is applied both before and after the laying of the paper. The investigations described here aimed rather at testing the effect of soil temperature and moisture of different types, grades and colours of paper. Separate trials were made each year from 1925-1928. In 1925 the paper was used without any crop at all. In 1926 a grain sorghum was used as indicator, in 1927 and 1928 potatoes. It was found that on a brown loam soil at Davis, California, during the dry season, under unirrigated conditions, the non-perforated black paper was the most effective for conserving moisture in the surface 4" of the soil, this being due to condensation underneath the paper. Soil temperatures were raised by black, reduced by grey papers. Under perforated paper the temperatures were the same as or lower than in the unmulched plots. Weeding was necessary where the perforated types were used. Both crops gave a slight increase in yield, but the author does not think the use of any type of paper at the present time under Californian conditions an economic proposition.

5. LUBIMENKO, V. N., AND HUBBENET, E. R. 581.174.1 : 631.523 : 551.52  
**The influence of temperature on the rate of accumulation of chlorophyll in etiolated seedlings.**

*New Phytologist*, 1932, 31 : 26-57, bibl. 50.

The writers used the only method which they consider practicable for the quantitative determination of this pigment, namely the spectrocoulometric method, an account of which with diagrams is given. The seedlings in question were wheat. Among conclusions reached are the following : The greening process of etiolated seedlings begins at 2-4° C., attains its maximum from 26-30° C., and ceases at about 48° C., which points are independent of exposure to light. This relation to temperature rests on the influence of temperature on the synthesis of leucophyll and on its transformation into chlorophyll. The increase in the production of chlorophyll during the first period of exposure to light is conditioned by the secondary influence of light on the reactions of chlorophyll formation. The diminution in chlorophyll production during the following period of exposure is conditioned by the retardation due to the accumulating mass of pigment remaining in the sphere of reaction. The fall in production per unit of time begins from the moment when the quantity of accumulated pigment attains approximately 40 per cent. of its limit quantity, independent of temperature. Above 30° C., a general fall in production occurs. This is probably due to a new reaction being set up at this temperature and the formation from leucophyll of another uncoloured substance, not chlorophyll, or perhaps the chlorophyll already formed is decomposed. This new reaction begins at about 26° C. and its rate increases with the rise in temperature.

## 6. COOK, R. C.

634/5(008)

**The first plant patent: and Three more plant patents.***J. Hered.*, 1931, 22: 313-9, and 369-72.

Some of the difficulties inherent in any system of granting plant patents were discussed by Bunyard in 1919 in the first issue of the *Journal of Pomology*, pp. 50-53. The patents now issued in the U.S.A. show the reality of these difficulties. Patents so far have been granted for (1) A climbing rose variety named "New Dawn" which except for its ever-blooming habit is identical with the Dr. Van Fleet rose, being apparently a bud sport from it. (2) A red rose, hybrid of General Jacqueminot and Richmond. (3) A white carnation, which is a sport of the pink *Sophelia*. (4) A thornless and productive sport of the Young dewberry. The theory of a patent is that in exchange for monopoly privileges the inventor "discloses" his invention. There would, however, appear to be little invention concerned in picking out a bud mutation, while the breeder can disclose the exact steps he took to get his variety and these may be of great importance in establishing his right to the discovery. Yet every step could be followed by persons "skilled in the art" with only the remotest chance of achieving the same result. The writer reproduces the specifications and claims of these patent plants and discusses the problems raised by their being granted.

## 7. HAGEMANN, A.

631.535.7

**Untersuchungen an Blattstecklingen. (Investigations on leaf cuttings.)***Gartenbauwissenschaft*, 1932, 6: 69-195, bibl. 202.

The author while noting his own particular results, reviews at considerable length the total results of all workers who have attempted leaf propagation. His own normal method is to remove whole leaves including stalks from the plants with a razor edge knife. The leaves are then set with their bases in a thin layer of moist sand, overlying soil in pots. The pots, containing 10-20 cuttings each, are put in glass frames and kept thoroughly moist. Protection from direct sunlight is given. Various other media have been tried for particular kinds of plants but always with a control as above. Results together with bibliographical references are tabulated. A few notes from his lengthy summary follow. 1. *Capacity for root and shoot regeneration.* Of gymnosperms 21 species were tested, 6 formed roots only, and the remainder died without forming roots or shoots. 141 kinds of monocotyledons were tried. Of these 25 (17.7%) formed roots and shoots, 4 (2.8%) roots alone, 2 shoots alone and the remainder nothing. Out of 1,042 dicotyledonous species the leaves of 264 (25.3%) species formed roots and shoots, of 491 (47.2%) roots only, of 23 (2.2%) shoots only. The rest made no new growth. Among the families of the monocotyledons and dicotyledons the following showed very little inclination towards new growth: *Gramineae*, *Orchidaceae*, *Papaveraceae*, and *Ranunculaceae*, while considerable proneness thereto was shown by the *Begoniaceae*, *Gesneriaceae*, *Halorrhagaceae*, *Lentibulariaceae*, *Piperaceae*, *Scrophulariaceae* and *Solanaceae*. 2. *Arrangement of new growth.* Roots arise with few exceptions at the base of the leaf where it is cut off. Shoots are also mainly found to arise from there. Other less usual places of origin are (a) the point of insertion of the stalk, and (b) the new roots themselves. 3. *Conditions necessary for regeneration.* Regeneration is in some species dependent on the age of the leaf. Moisture favours the process. The most propitious time coincides with that of the best vegetative growth of the mother plant. The precise impetus which sets up regenerative growth is undetermined. Wound stimulus is certainly not the cause and the stoppage of nutrients probably not. The interruption of the connection between the growing point and the leaf is a determining factor. 4. *The new tissues.* The shape of these corresponds with that of similar organs in the original plant, though the first leaves are often misshaped. 5. *Actual development.* Separated leaves form extensive wound tissue of different sorts, the vascular bundles playing an important part in the process. Adventitious roots\* always arise on such leaves internally from the cells of the vascular bundle itself or closely contiguous cells. True regenerative shoots are formed from the leaf tissue

\* One possible exception is quoted.



itself or from the wound callus. In the first case they arise from cells of the epidermis or internally from those of the subepidermal or more deep seated parenchyma. Those from the wound callus originate either externally from cells lying on the upper surface of the callus or internally in the inside of the callus.

## TREE FRUITS, DECIDUOUS.

### *Varieties.*

8. WOODWORTH, H. C., AND POTTER, G.F. 634.11  
**Studies in economics of apple orcharding. 1. An apple enterprise study—costs and management.**  
*New Hampshire Agr. Exp. Sta. bull. 257, 1931, pp. 71.*

This is the first of a series of four economic bulletins on apple growing in New Hampshire. Data have been and will be taken from twelve farms, which in 1927 had 19,132 trees, individual orchards varying in possession of from 503-4,315 trees. Thirty-five percent. of the trees were under 10 years, 51% between 10 and 19, and 14% 20 years or more old. Of the bearing trees 42% were Baldwin, 23% McIntosh, 12% Wealthy, 5% Wagner, 4% Gravenstein, the newer plantings showing a large percentage of McIntosh. The trees were mainly in sod mulch and generally there was no difficulty about getting vigorous tree growth. The different necessary operations are considered in detail and costs estimated, these being differentiated into man, horse, truck and tractor costs per 1,000 mature trees, and per 1,000 boxes yield, the former being reckoned equivalent to a 40 acre orchard at its prime. The management problem was found to hinge largely on the organization needed for spraying, an operation demanding skilled labour and expensive equipment for definite short periods. The study indicated that only pruning sufficient to get a strong framework with the young tree and keep the mature tree of reasonable height and free from weak wood was profitable. The sod mulch system was found exceedingly economical. Labour requirements before and after harvest were found to be about the same.

9. PALMER, R. C., AND STRACHAN, C. C. 634.11 : 575.252  
**Red sports of the Delicious apple.**  
*Northwest Fruit Grower, 1931, 3 : 9 : 5, 12, 18.*

The authors sound a note of warning to growers of Red Sport Delicious that the public taste for Delicious may decline, if by premature picking of these red strains growers place on the market Fancy and Extra Fancy grade, i.e. highly coloured, but unripe fruit. Comparing apples in four districts at three different dates, they found on the first date, October 2nd, that, whereas three-quarters of the crop of each of the trees of the red strain had already developed red colour enough to qualify for the Extra Fancy grade, only a very small proportion of the fruit of ordinary Delicious was so coloured. The flesh colour of both was also noted, when it was found that grading for red colour placed almost all green fleshed fruits in the Cee grade in the case of ordinary Delicious, whereas with the red strains these green fleshed fruits developed sufficient red colour to qualify them for the Fancy and Extra Fancy grades. "Quality" tests, as carried out by one taster in every case, showed that the correlation between flesh colour and "quality" was very close. Analysis of sugar also showed the poor quality of Extra Fancy and Fancy fruit picked from the red strains at the earliest date. Analysis figures are given for sugar percentages obtained from the different pickings. Hydrogen-ion determination and electrical conductivity tests were also made on the expressed juice and the keeping qualities were compared. The hardness figures are so similar as to suggest the absence of any material difference between the red strains and ordinary Delicious grown under the same conditions and harvested at the same stage of maturity. The data amassed from the one year's experiments to date at least suggest the need for care to avoid premature picking of the red strains.

10. BREGGER, J. T. 634.23:581.162.3  
**About the Deacon cherry.**  
*Better Fruit*, 1931, 26 : 6 : 12.

The Deacon cherry has proved to be the best pollenizer for Bing, Lambert and Royal Ann and appears to be a better commercial variety than any of the pollenizers in use at the present time (in U.S.A.). It is said to be synonymous with "Black Tartarian Improved."

11. ARTHUR, J. M., AND SHIRLOW, N. S. 634.22 (94.4)  
**Burbank's plums and prunes in New South Wales.**  
*Agr. Gaz. New South Wales*, 1931, 42 : 795-802, bibl. 3.

A review of the results of the work of Luther Burbank in cross-breeding with European, American and Japanese plums, with special reference to the resulting varieties which can be grown in New South Wales. Descriptions and criticisms of these are given.

12. MOFFETT, A. A. 634.1 : 576.312.32  
**A preliminary account of chromosome behaviour in the Pomoideae.**  
*J. Pom. Hort. Sci.*, 1931, 9 : 100-10, bibl. 10.

Investigations have shown that apple varieties may be classified, according to their chromosome number, into diploids and triploids, which show marked incompatibility on crossing. This article may, perhaps, be considered as a summary in simple language of the work by Darlington and Moffett at the John Innes Institution on this subject, more detailed accounts of which will be found in the *Journal of Genetics*, 22 : 129-51, and in the *Proceedings of the Royal Society*, B 108 : 423-46. By means of cytological studies with varieties of apples and pears the author has deduced the fact that the characteristic chromosome number of seventeen, which is the basic number of the *Pomoideae*, is in reality a secondary basic number, and that the derived series of polyploids are secondary polyploids. He shows that the thirty-four chromosomes of the diploid *Pomoideae* are of seven types, of which four are represented four times and three are represented six times. He thinks that the *Pomoideae* group may possibly owe their distinctive morphological characters to the reconstitution of their chromosome complement.

H.M.T.

13. MARSHALL, R. P. 631.541.7 : 678.11  
*Propagation.*  
**A rubber dressing for tree wounds.**  
*Phytopathology*, 1931, 21 : 1089.

A preparation consisting of rubber latex containing vulcanized rubber suspended in a colloidal state is now on the market with a view to its use as a dressing for tree wounds. It was tried by the author in the spring of 1930. He found that it dried quickly, and that the resulting rubber film seemed relatively impervious, highly elastic, strongly adhesive to wood and of great tensile strength. Throughout the growing season it resisted the action of weather and the organic substances present on the wounds. The cambium region was not injured by it nor growth retarded. Callusing even appeared to be somewhat stimulated as compared with untreated wounds. It is easily applied with a brush or sprayer, even during low temperatures. It could probably be usefully applied to the various processes of budding and grafting.

#### Rootstocks.

14. NEBEL, B. R. 634.23-1.541.11  
**A thumb test\* for distinguishing Mazzard (*P. avium* L.) and Mahaleb (*P. mahaleb* L.) rootstocks.**  
*Amer. Naturalist*, 1931, 65 : 95-6, bibl. 3.

Small bits of roots of approximately the same size are put in separate vials containing an aqueous solution of 4-10% iron alum. The solution containing the Mazzard root darkens in a few minutes

\* See also H.A., 1931, 1 : 1 : 39.



and continues to get darker from 1 to 48 hours after immersion according to the amount of liquid and size of piece. The vial holding Mahaleb root remains practically clear and undarkened. Roots of trees of different size and vigour have been tested at all times between May and November. The differential changes in colour are due to the different amounts of soluble tannic substances present. It is thought that it should be possible to carry out the test with various reagents for detecting tannic substances.

15. HATTON, R. G. 634.11-1.541.11/12  
**The influence of vegetatively raised rootstocks upon the apple, with special reference to the parts played by the stem and root portions in affecting the scion.**  
 (Paper presented at the Horticultural sub-section of Section M, British Association Centenary Meeting, London, September 25th, 1931.)  
*J. Pom. Hort. Sci.*, 1931, 9 : 265-77, bibl. 16.

The author reviews the East Malling results with stem worked, vegetatively raised rootstocks and shows how his original classification into four main groups has with certain qualifications been confirmed. Rootstocks have been proved to influence scions consistently in definite known directions. That part of this influence lies in the stem has been proved by working with intermediate stem pieces. Evidence is here produced for the first time that this influence does not exist merely in the stem, but can be present and transmitted from the rootstock, when the scion is worked directly on the root. Experiments have been in progress at East Malling since 1927, using Beauty of Bath and Grenadier scions and working these on stem and piece roots of Nos. VIII, IX, II and VI, which indicate very strongly that the rootstock effect inherent in these particular stocks is being definitely shown in the usual way in the habits, not only of the stem-worked scions, but also of those worked on piece roots.

*Growth, Nutrition, etc.*

16. TUKEY, H. B., AND BRASE, K. D. 631.547 : 631.541.11/12 : 634.11+634.23  
**Correlation studies of the growth of apple and cherry trees in the nursery from the seedling to the two-year budded tree.**  
*New York Agr. Exp. Sta. Geneva tech. bull.* 185, 1931, pp. 31, bibl. 11.

The preliminary results from this carefully laid out experiment, deal with growth studies of some 18,000 closely graded, imported Mazzard cherry and French crab apple seedlings, budded respectively with Montmorency cherry and McIntosh apple scions. Statistically examined their data so far lead the authors to the following conclusions :—There is only a small likelihood of the seedlings large at planting remaining large at the end of the season. There is just as good a chance for a small seedling as for a large seedling to produce (a) a large yearling whip, (b) a large 2 year tree. There is a strong likelihood that the rootstocks which are largest at the end of the budding season will produce (a) the largest 1 year whips, (b) the largest 2 year trees. There is a very strong likelihood that the largest 1 year whips will become the largest 2 year trees. The importance of the bud union in the production of a large nursery tree is shown to be less than that of the amount of growth of the rootstock during its first season in the nursery row.

17. HAMILTON, R. G. I. 634.11-1.55  
**Biennial bearing in apple trees.**  
*New Zealand J. Agr.*, 1932, 44 : 38-41.

The author considers that the question appears to be largely governed by leaf area, and hence attention should be focussed on getting more uniform leafage each year. In pruning and manuring lie the greatest hopes of breaking the habit, thinning being of subsidiary use. The aim of pruning is to get greater leaf growth in the spring of the heavy year and to restrict blossoming in the same year. Spur bearers most readily become biennial croppers. Such trees



should be heavily spur pruned the winter prior to the "on" year and all old clusters of spurs severely reduced. This reduces the blossom and helps in the production of lateral growth. The following winter the laterals which have formed should be cut back to induce further lateral growth in the light season. In the next winter, i.e. that preceding the "on" year, these laterals should be left uncut so as to form blossom buds, which will bloom during the following light year. With lateral bearers old weak laterals should be removed each year and new laterals encouraged, which should be uncut in the winter preceding the heavy year, so that they may then form blossom buds for blossoming in the "off" year. In the winter preceding the "on" year blossom spurs should be well thinned out, the aim being to promote blossom bud formation on the uncut laterals. Manuring should be an adjunct to pruning. It might well consist of a light dressing of nitrogenous fertilizer in the early spring of the light year to increase the set of fruits, while a further dressing of sulphate of ammonia should be given during blossoming, to swing the carbohydrate-nitrogen balance in favour of nitrogen and so favour leaf bud and not blossom bud formation. In the spring of the "on" year no nitrogenous manuring should be given. Normal applications of phosphatic and potassic fertilizers should be made.

18. DAVIS, L. D. 634.22 : 581.13  
**Some carbohydrate and nitrogen constituents of alternate bearing sugar prunes associated with fruit bud formation.**  
*Hilgardia*, 1931, 5 : 6 : 119-54, bibl. 50.

Chemical analyses were made for two years to determine the amounts of reducing substances and starch present in spurs and wood and bark adjoining them, the picric acid and copper reduction methods being used. Fifty-five per cent. of the spurs disbudded in 1927 formed fruit buds again that year, while only 9.5 per cent. of those bearing in 1927 formed fruit buds in the same year. After about May 1st reducing substances in the bearing trees in all fractions are, on a dry weight basis, greater than in the non-bearing trees. Total nitrogen shows small but consistent differences, constant for all the fractions taken and for the two years. Before May 1st the bearing trees have a nitrogen content higher than the non-bearing, but after this date the total nitrogen content of the bearing trees is less than that of the non-bearing. Starch is found to be consistently higher in the non-bearing than in the bearing trees and the difference becomes considerable after the first flush of growth. The roots of the bearing trees contain relatively little starch compared with those of the non-bearing. The author suggests that rootgrowth is probably suppressed, when the demand for carbohydrates above ground is heavy. Starch shows two maxima and two minima. A third maximum may be shown in bearing trees. A very sharp maximum is shown in the non-bearing trees in spring. Starch content and moisture show an inverse relationship. The increase of total sugars per fruit in the 3 weeks before harvest is enormous and is accompanied by a corresponding depletion of starch in the branches behind the spur. Allowing the fruit to become fully ripe on the tree, as is done in the case of sugar prunes, is a very exhaustive process as regards carbohydrate reserves. There is indication that the nitrogen occurring in fruits and flowers is not accounted for by that lost by the spurs and adjoining wood and bark but must come from more remote parts.

19. TETLEY, URSULA. 634.11 : 576.3  
**The morphology and cytology of the apple fruit, with special reference to the Bramley's Seedling variety.**  
*J. Pom. Hort. Sci.*, 1931, 9 : 278-97, bibl. 12.

Detailed records were taken of weather and of fruit development. The latter were made from fresh Bramley's Seedling apples gathered from one tree at about 10 day intervals from June 2nd to November 18th, 1930. Samples were preserved in formalin acetic alcohol, Bouin's solution or in 50% alcohol. Sections were taken of this preserved material. Two graphs show respectively throughout the above period (1) the changes in starch content, and (2) the hours of

sunshine per day, average daily temperature, average weight per apple, average area of cross section of cells forming the flesh, the average area of cross section of unit length of cuticle. Details are also given of the varieties of epidermal structure found in Bramley's Seedling apple, of the lenticel structure of Bramley's Seedling and Ecklinville apples, the "deep" type of lenticel structure being found more favourable to the growth of fungal hyphae than the "shallow" type. The structure of the "eye" of the apple is described and the suggestion made that a likely method of attack by the fungi causing "eye rot" is from the deeper cracks in the cork, at the base of which only a few layers of suberized cells are present. It would appear possible that changes may go on in these walls and in the cells below under certain conditions, which would allow entry by the fungus.

20. MALHOTRA, R. C. 581.176.1

**A contribution to the physiology and anatomy of tracheae, with special reference to fruit trees. I. Influence of tracheae and leaves on the water-conductivity. and II. Water conductivity in higher plants and its relation to tracheae.**

*Ann. Bot.*, 1931, 45 : 593-620, bibl. 34, and *ibidem* 1932, 46 : 11-28, bibl. 33.

The first paper gives an account of the author's attempts to find the length and distribution of tracheae, their dimensions and numbers in different parts of the shoot, and the relationship between number and area of leaves and cross section area of the tracheae. After discussing the findings and difficulties of earlier workers he details his materials and methods, giving illustrations of his devices for forcing nitrogen, gas and mercury through shoots. He presents and discusses the indications given by his data on shoots of apple, plum, prune, peach, cherry, apricot, pear, quince, *Vitis Labrusca* and *V. vinifera*, contrasting differences especially in the tracheae of apples and prunes. His results indicate that only the last formed wood is concerned in transporting water. A unit area of prune tracheae was found to be nearly 50% more efficient in its conductivity of water stream than a similar unit of apple tracheae. In the second paper he shows, however, that the sap extracted from the tracheae of prune has greater density and viscosity and more sugars, proteins and ash than the sap of apple tracheae and is therefore more resistant to conduction. By means also of an apparatus, described at considerable length, he found that the walls of prune tracheae offered more resistance to the flow of sap than the walls of apple tracheae. Despite this there still seems to be 22.6 per cent. more efficiency in favour of prune than apple.

21. RIVIÈRE, G., AND PICHARD, G. 631.547.6 : 551.56 : 634.23 + 634.25

**Essai d'évaluation de la quantité de chaleur nécessaire à quelques variétés de pêcheurs et de cerisiers pour leur permettre d'atteindre la maturité de leurs fruits. (Attempt to evaluate the amount of heat necessary to enable certain varieties of peach and cherry to set and mature their fruit.)**

*Bull. Soc. Nat. Hort. France*, 1931, ser. 5, 4 : 674-79.

The experiments were begun in 1928 and continued in 1929 and 1930 on six varieties of early peaches and eight varieties of cherry. Forcing under glass began early in January with the temperatures from 14-16° C. (57.2-60.8° F.). Tables are given for each variety for each year giving dates of unfolding, flowering, colouring and ripening, and for each of the above states are shown the number of hours of sunlight, the number of hours of sunlight plus a coefficient corresponding to the mean intensity of solar radiation during the month, the number of hours taken to arrive at each state from the start, and the mean temperatures. Certain points noted are that under forcing conditions the peaches developed leaves from 3 to 8 days before they flowered, whereas in the open even in the warmest situations these varieties flower 4 to 6 days before they leaf. In 1928 both the peaches and cherries took longer to start than they did in 1930, although the

daily mean temperatures in the latter year were appreciably lower. From this it is deduced that it is useless to raise the temperature above 14° C. until the leaf or flower buds have burst. The subsequent stages and colouring and ripening were, however, accelerated in direct ratio to the rise of temperature and the intensification of the light.

*Pollination.\**

22. VANSELL, G. H.

581.135.54(79.4)

**Nectar and pollen plants of California.**

*Univ. Calif. Coll. Agr., Agr. Exp. Sta. Berkeley, bull. 517, 1931, pp. 60, bibl. 7.*

The writer utters a plea for a nearer study by plant physiologists of nectar secretion. The knowledge so acquired would be of economic value to beekeepers and fruitgrowers. Observations on plants commonly found in California and valuable as a source of honey are here recorded. Of 148 plants, of which particulars are given as to colour of blossom, time of blossoming and colour of honey, the following are noted as very important:—alfalfa (*Medicago sativa*), the sages (black, purple and white), *Salvia mellifera*, *S. leucophylla* and *S. apiana*, buckwheat (*Eriogonum* sp.), Christmas berry (*Photinia arbutifolia*), orange (*Citrus aurantium*), and yellow star thistle (*Centaurea solstitialis*). In addition 37 others are cited as important or fairly important and the remainder are said to be of minor importance. Although the author does not consider that importance in this respect is sufficient reason for growing such plants, he suggests that much can and should be done to foster their spontaneous growth.

23. SCHANDERL, H.

634.1/2 : 581.162.3

Untersuchungen über die Befruchtungsverhältnisse bei Stein- und Kernobst in Westdeutschland. (**Studies on pollination of stone and pome fruits in Western Germany.**)

*Gartenbauwissenschaft, 1932, 6 : 196-239, bibl. 25.*

The critical state of viticulture in the valleys of the Ahr, Mosel, Saar and Sauer has turned the thoughts of growers in those districts to fruitgrowing. It has fallen to the lot of the Provincial Horticultural Institute at Trier to determine the pollination requirements of the varieties of fruit trees which seem to offer the best prospects. The writer explains at some length and with great clearness the meaning of certain terms commonly used in pollination work and then proceeds to give an account of his experiments both in sugar solution and in the field. One interesting point in the latter was his use of nets for blossom clusters under pollination tests by which all fruits which formed were retained on the tree. Fishing netting was used of 2 cm. mesh for apples and pears and 1 cm. mesh for plums, cherries, etc. Among other conclusions reached by him are the following:—All peaches and apricots, tried proved self fruitful:—Amsden, Frühe Beatrix, Mamie Ross, Venusbrust, Aprikose von Nancy. All 14 sweet cherry varieties proved practically self-sterile. Of 8 acid or semi-acid cherries Early May alone was not found adequately self-fruitful. The results of earlier workers were confirmed in the case of Greengage and Count Althan's gage, which were found self-sterile, but contrary to expectation the Drap d'Or, Mirabelle von Nancy and Mirabelle von Flotow were also found self-sterile. Twenty-five pear varieties all showed themselves practically self-sterile. Where parthenocarpic fruit formation actually took place, it was much inferior to that following cross pollination. A curious fact was noted in the case of the pollen of Windsor. This was ineffective on 258 stigmas of 9 different sorts of pears but was very effective on those of Stuttgarter Gaishirtl. This seems to support the theory that the pollen compatibility problem exists among pear varieties. The thirty-one apple varieties tested, including those described as self fruitful by Branscheidt, proved practically self-sterile. This self-sterility, as also that of the pears, could not have been due to nutritional or climatic conditions, though these definitely affect an inclination to parthenocarp. Only Charlamowsky and Ananas Reinette produced good, marketable parthenocarpic fruits. A comparison of the results of his pollen culture and stigma tests with those got in the field lead the author to consider that field experiments are the only way to get reliable knowledge on practical pollination problems in the orchard.

\* See also 10.



24. ELSSMANN, E., AND VON VEH, R. 634.11 : 581.162.3  
 Beiträge zur Frage nach den Befruchtungsverhältnissen der für Deutschland wirtschaftlich wertvollsten Kern-, Stein- und Beerenobstsorten. I. Nachweis der Reduktionsteilung im weiblichen Archespore von *Malus* (bei der Sorte Schöner von Boskoop). (**Pollination problems of the most important economic fruits grown in Germany. I. Proof of the reduction division of the female archespore of *Malus* (Belle de Boskoop).**)  
*Gartenbauwissenschaft*, 1931, 6 : 1-54, bibl. 778.

The authors worked on material from a bush tree of Belle de Boskoop, which, having lost untimely part of its leaves in consequence of a severe attack of scab, proceeded to flower in October, 1930. The flowers were normal. Material was thus available in all stages of development and was submitted to cytological examination to determine the process of development in the archespore and decide the question of the haploid or diploid character of the oosphere in the ovule of this variety. Microphotographs illustrate their work and the apparatus used is detailed. They find that the female archespore of Belle de Boskoop is haploid. The reduction division of the macrospore mother cell is as regards the division of the univalent chromosomes in Belle de Boskoop similar to that of the microspore mother cell; in contradiction to Kobel's theory they are unable to find any disturbance in the development of the female sex cells at the decisive stages. The completed tetrad is found to be of full complement, consisting of the uninuclear macrospore and three degenerating sister cells, a fact which runs contrary to the findings of Péchoutre and Osterwalder. This valuable article is completed by a monumental bibliography on pollination, mainly of fruit.

#### *Manuring.*

25. ANTHONY, R. D. 634.11-1.8  
**Soil organic matter as a factor in the fertility of apple orchards.**  
*Pennsylvania Agr. Exp. Sta. bull.* 261, 1931, pp. 35, bibl. 9.

The author discusses data yielded by the apple plots at his Station over a number of years when subjected to different types of cultivation. His results stress the great importance of keeping up the organic content of the soil by cover crops, manuring, etc. He considers that cultivation without cover crops quickly results in unprofitable trees through depletion of the organic matter. Cover crops moreover grown without fertilizers seldom make enough growth to maintain fertility. Cover crops properly manured add greatly to the organic content of the soil. It has been found under Pennsylvania conditions that, if an orchard is down to blue grass (*Poa* sp.), heavy applications of nitrogen at first stimulate both trees and grass, but that if the blue grass is left down for 4 or 5 years, tree growth becomes checked and its response to even very heavy nitrogenous dressings is meagre. Ploughing up such a sod builds soil fertility by increasing the water holding capacity of the soil and by speeding up biological activities, which increase the available plant food, particularly nitrates. The author thinks that on soils well adapted for grass sod fertility may probably be best maintained in the mature apple orchard by sod rotations rather than by annual cover crops.

26. SHUTT, F. T.; AND WRIGHT, L. E. 631.8  
**Manures and fertilizers. Their nature, functions and application.**  
*Domin. Canada Dept. Agr. bull.* 145 (N.S.), 1931, pp. 68.

After a short discussion of the factors which constitute soil fertility, the writers describe essential features of the different forms in which plant food is provided under ordinary farming conditions in Canada. Those discussed are :—*Farm manures*—different types—precautions against loss of valuable constituents—methods of application. *Green manures*—objects—claims of particular kinds of leguminous crops—experimental results. *Artificial manure*—a possible

substitute for farm manure. *Artificial fertilizers*—characteristics of different types of nitrogenous, phosphoric and potassic fertilizers—residual values. The mixing and times and methods of application of fertilizers are also discussed. Suggestions are made for general guidance in deciding the manurial needs of particular field crops. For apples it is suggested that continuous nitrogenous manuring may cause too great wood growth and hence, generally speaking, nitrogenous applications should be accompanied by dressings of potash and phosphates in fairly available form. The writers consider that apples grown in sod without cultivation need considerably more nitrogen than under other conditions. In a final chapter the value of such indirect fertilizing agents or soil amendments as lime, gypsum, peat and muck is demonstrated.

27. MANARESI, A., AND OELKER, G. 631.84 : 631.547.5 : 634.13 + 634.25  
 Concimazioni azotate precoci e fruttificazione nel pero e nel pesco. (**Nitrogenous manuring just before blossoming and its effect on fruiting in the pear and the peach.**)  
*Malpighia*, 1931-2, 32 : 29-64, bibl. 39.

The authors first summarize American work on the subject and then describe their own experiments. These were carried out on a heavy, unkindly soil, showing a total nitrogen of 0.037-0.042%,  $P_2O_5$  0.068-0.076%, and lime about 10%. The pears and peaches were 13-14 years old, had received slightly different pruning and training and were growing in different blocks. Trees in these blocks which showed any marked peculiarities of size, condition, etc., were discarded for experimental purposes. The pear varieties were Williams, Bergamotte d'Esperen and Vicar of Winkfield, the peaches were Massalombarda. Some 87 pear trees in 5 different blocks were given doses of nitrate of soda and their subsequent behaviour compared with that of 84 trees untreated, also divided among the same blocks. 61 peach trees were treated as against 55 control trees. Tables of actual results in flower and fruit formation are given and these are summarized as follows :—The addition of 0.85-1.5 kg. (=1.87-3.3 lbs.) nitrate of soda to each pear or peach 16 days before full flowering :—1. Noticeably increases the nitrogen content of flowers, newly formed fruits and leaves. 2. Just about doubles the percentage set of flowers and so the number of fruits and production of each plant. 3. Slightly lowers the average weight of individual fruits. 4. Has little effect on appearance and on growth vigour of the plants.

28. OVERLEY, F. L. 634.11-1.8-1.67  
 Relation of irrigation to fertilizer and spray practices on size and colour of fruit.  
*Northwest Fruit Grower*, 1931, 3 : 11 : 5, 14, bibl. 4.

Comparing the sprinkler and the furrow method of irrigation the author considers the latter more economical under ordinary conditions of soil and level ground. Where, however, the loose open character of the soil leads to great waste of water under the furrow system or the ground is on a steep slope, the sprinkling systems may be installed to advantage. It was found that trees in all sprinkler plots at the Washington State Experiment Station made greater terminal growth than those in the furrow irrigated plots. The differences in size of fruit was increased to about the same degree as in tree growth. Less water was actually applied with the sprinklers, though, allowing for run off with the furrow system, about the same amount was taken up by the soil. Trials were also made of varying the amounts of irrigation water applied and of applying different fertilizers and observing the result on the fruit obtained in 1931. The results indicated that "nitrogen-bearing fertilizers have a greater influence on the size and colour of fruit than has the amount of water applied to soil above the amount required to maintain a soil moisture adequate for tree turgor and growth, and sufficient for maintenance of the required transpiration rate and to prevent wilting." Irrigation water and fertilizer applications have a direct bearing on the spray materials that can be used and the number of times these can be applied without affecting the size and colour of fruit. For, with trees below normal as the

result of poor irrigation and low plant food, even one or two applications of oil sprays may reduce the functioning of the foliage or cause leaf burning. On the other hand trees in good growing condition have shown no reduction in size and colour of fruit from 4 or 5 applications of oil sprays of the light-medium-type with 65-70 seconds viscosity.

### Plant Protection.

29. TATTERSFIELD, F. 632.951.1

**Pyrethrum flowers. A quantitative study of their development.\***

*Ann. App. Biol.*, 1931, 18 : 602-35, bibl. 8.

An account of the examination of the flowers of pyrethrum plants, *Chrysanthemum cinerariaefolium* on a bed at Harpenden. The plants were grown in randomized blocks, the flowers being harvested from a dozen plants each week over a period of 8½ weeks, the flower heads ranging from the small bud stage at the beginning to the overblown stage in the last week. The data, which are submitted to statistical analysis, indicate that there is a quantitative development of the active principles in the flower heads from the small bud stage up to the time of maturity. The content of Pyrethrin I and II, both relatively and absolutely, rises to a maximum at the maturity of the flowers. The mean percentage content of pyrethrins fell after pollination and fading of the flowers. Hence the best time for harvesting, from the point of view of percentage content of active principles and of yield of flowers, would appear to be when flowers have just reached full development.

30. McMUNN, R. L. 632.8

**Bridge-graft and save trunk-injured fruit trees.**

*Univ. Illinois Agr. Exp. Sta. circ.* 381, 1931, pp. 20.

A bulletin of practical advice including the following suggestions:—Carry out before growth starts in spring; use dormant scion wood of the previous season's growth; arch the scions; use scion wood from the same varieties except when these varieties are susceptible to diseases such as collar rot and fireblight and the primary damage has been done by these diseases. In these cases scions from other varieties must be used. The author shows with illustrations how the scions should be cut and the trunks prepared, and deals with the preparation and use of the necessary grafting wax. He ends with some practical hints on methods of avoiding injury by rodents.

31. DIEHL, H. C., AND OTHERS. 632.951.23 : 634.11 + 634.13

**Removing spray residue from apples and pears.**

*U.S. Dept. Agr. Farmers bull.* 1687, 1931, pp. 31.

A bulletin for the practical fruit farmer who finds it necessary to remove arsenical spray residue from his apples and pears. Dry cleaning methods are discussed but not recommended owing to their inefficiency and danger of mechanical injury especially to pears. Alkaline solvents have also been found to endanger the fruit. Exposing the fruit from 0.5 to 5.0 minutes, according to the type of equipment, to an HCl solution (1 to 4 gallons per 100 gallons H<sub>2</sub>O) has proved the best method. Notes on testing the acidity of solution, and on the handling of the concentrated acid are given: Warming to 80°-100° F. helps the process. Additions to the solution which have been found beneficial are a special type of paraffin emulsion and common salt. The necessity for rinsing and careful handling of fruit as also for the careful and periodic changing of the solution is stressed. Two simple types of home-made washing equipment are described and the costs entailed discussed.

\* See also H.A., 1931, 1 : 2 : 157.



## SMALL FRUITS, VINES AND NUTS.

32. HOBLYN, T. N. 634.711-1.8 : 531.084.2  
**The layout and conduct of two manurial trials of raspberries : together with the deductions which can validly be drawn.**  
*J. Pom. Hort. Sci.*, 1931, 9 : 303-30, bibl. 9.

A description of two large scale trials with the varieties Pyne's Royal and Lloyd George, extending over the last four years at East Malling. The plots of Pyne's Royal consisted of three lengths of row each 20 yards in length, adequately protected by guard and buffer rows. Each plot, consisting of about .032 acres gross area, or .025 acres cropping area, was repeated eight times. In the case of Lloyd George plots were smaller, local variations being less, and consisted of two lengths of row 25 yards long, giving a manured area of .029 acres, or cropping area of .019 acres. Replication was the same. The method of randomized blocks was used. The author shows that the trials bring out two points very clearly :—"Even in large scale trials with comparatively large plots, uniformity of material and freedom from disease are essential. Differences due to position on the ground may prove much greater than differences due to the results of manurial treatment ; so that a proper distribution of replicated plots is absolutely necessary. Results indicate that on this soil, with two varieties of very different habit, a proper balance between nitrogen and potash is the secret of successful manuring of raspberries." Nitrogen applied alone has sometimes produced more cane but never a greater crop except in the presence of potash. Sulphate of potash proved superior to kainit. The time of application of potash depends upon kind and season.

33. DARROW, G. M. 634.713 : 575.252  
**A productive thornless sport of the Evergreen blackberry.**  
*J. Heredity*, 1931, 22 : 405-6, bibl. 2.

Previous thornless sports of the Evergreen have been entirely or nearly sterile and very weak. The new one described here produced typical Evergreen blackberry fruit and the plants were apparently as vigorous, hardy, and desirable as those of the thorny Evergreen. In a field planted with the sport the writer found occasional thorny canes coming from the roots. Further two canes were found thorned on one side and thornless on the other. Occasional leaf petioles and fruit pedicels were also seen showing thorns. This points to the sport being chimeral in character with a thin layer of thornless tissue overlying the usual thorny tissue. Its propagation therefore will have to be by layering the tips.

34. HEERMANN, W. 634.73  
 Weitere Beiträge zur Heidelbeerzüchtung.\* (Further notes on raising bilberries.)  
*Züchter*, 1932, 4 : 1-8, bibl. 4.

Out of the 100 or more known botanical varieties some 40 from North and South America, Asia and Europe are now being tried out at Landsberg, Warthe, Germany. Though some have not yet flowered, certain interesting facts have already been noted. Speed of germination has varied from 2-3 weeks in *Vaccinium Myrtillus* to 2-12 months in *V. Idaea*. Some of the imported cultivated varieties are much deeper rooted and will hence probably be found less frost susceptible than the native *V. Myrtillus*. Most cultivated N. American sorts originated from *V. corymbosum*. This grows to a height of 6 feet, has blue, white-fleshed berries, which possess considerable bloom, and is apparently pretty frost resistant. The difficulty is that its water requirement is excessive, but it should be useful for crossing. Notes are given on the Adams, Rancocas and Grover varieties. These ripen in order given, Grover being considerably later than the others. For dry soils *V. pallidum*, a native of Virginia, will be tried out. Having 36 chromosomes it will, however, not cross with *V. corymbosum*, though it might be crossed with the very large *V. virgatum*,

\* Züchter, 1931, 3 : 38-44 and H.A., 1931, 1 : 2 : 166.

also of 36 chromosomes, which grows further south to a height of nearly 10 ft. and is known to bear well at an age of 30. Among other varieties under trial are: *V. atrococcum*, a big shrub, very like *V. corymbosum*. It needs considerable moisture. *V. vacillans* (12 chromosomes) is sweet and likes dry conditions, height 1 metre. *V. pennsylvanicum* (24 chromosomes) height 60 cm. has crossed in nature with *V. corymbosum*, *V. amoenum* being one of the results. It ripens very early. *V. mortinia* from S. America is very aromatic. Of Asiatic sorts *V. Dunalianum* and *V. glauco*—*album* show xerophytic characters. Attempts will be made, while paying proper attention to climatic conditions, to raise berries with few seeds and if possible ripening simultaneously on the cluster, a habit which is not normal.

35. ADDOMS, RUTH M., AND MOUNCE, F. C. 634.76-1.8  
**Notes on the nutrient requirements and the histology of the cranberry (*Vaccinium macrocarpon*) with special reference to Mycorrhiza.**  
*Plant Physiol.*, 1931, 6 : 653-65, bibl. 15.

Cranberry plants were grown in sand cultures supplied with nutrient solutions containing ammonium or nitrate nitrogen in every case except one, where no nitrogen was present. Mycorrhiza was found in all, though to a smaller degree in the last named cultures. The small growth in this nitrogen deficient series indicated that nitrogen fixation by the endophyte *Phoma radidis*, if indeed it actually took place, was quite inadequate as a source of nitrogen for the cranberry. The experiments indicated that ammonium sulphate can be used to promote vegetative growth of cranberry plants. To what extent the green plant is helped by the endophytic fungus in the absorption and utilization of nitrogen has yet to be determined.

36. WOODFIN, J. C. 634.8-1.541  
**Green grafting of the grape vine.**  
*New Zealand J. Agr.*, 1931, 43 : 356-8.

Description of a method of herbaceous grafting of grape vines introduced into New Zealand by Dalmatian settlers. Practised workers get 95-100 per cent. successes and the method has superseded all others in Dalmatia. In field work the rootstock cuttings are planted in their permanent positions with the scion wood planted out halfway between the stock rows. The grafting is done when the root cuttings are in their second leaf. In a season or two, when the grafted plants have grown, the intermediate rows of scion wood are removed after having perhaps borne a crop or two of grapes. The graft, a simple splice or whip graft without tongue, is made when the grapes are in flower. Both stock and scion should be quite green and tough enough to withstand bending without snapping. A scion is preferred to consist of two nodes and two inches of internode below the bottom node. The stock is cut upwards about 2 inches above the third or fourth bud, if possible so that the bud below the cut will be in the opposite side of the stock to the bud on the scion, which must always point upwards when grafted. The leaves are trimmed off the scion but are left on the stock. Two shoots on each stock are grafted and the remainder cut off. The binding material is thin rubber ribbon,  $\frac{3}{8}$  inches wide, and when in place it is protected from the sun by a vine leaf. The tie should be removed in two months.

37. QUINN, G. 634.8-1.535.4  
**Influence of the season of planting on the rooting of grape vine cuttings.**  
*J. Dept. Agr., South Australia*, 1931, 35 : 420-30.

The writer first discusses the normal treatment accorded to vine cuttings prior to planting and then proceeds to detail and comment on the pertinent work carried out at the Adelaide Demonstration Vineyard and Orchard between 1920 and 1930. The actual vine is an unknown variety erroneously called Pedro Ximines. Cuttings were taken and planted, or prepared for later planting, in June, July and August and the results noted and tabulated. The data indicate that (1) under coast conditions of S. Australia varying the time of planting between May, June

and July does not seriously affect the percentage rooting of cuttings obtained ; (2) May planted cuttings produce the heaviest and strongest rootlings ; (3) within limits stronger rootlings may be expected from the stronger, short-jointed, flatter and well-ripened canes ; (4) tying in bundles and heeling in for a month or longer is harmful ; (5) abundant rainfall after planting is of greater value to root production than large quantities prior to planting ; (6) the most favourable temperatures for the month after setting out the cuttings appears to range between 50-53° F., in the soil at the base of the cuttings and between 54-55° in the shade at 4 ft. above ground level.

38. WINKLER, A. J. 634.8-1.542  
**Pruning and thinning experiments with grapes.**  
*Univ. Calif. Coll. Agr., Agr. Exp. Sta. Berkeley, bull.* 519, 1931, pp. 56,  
 bibl. 9.

The experiments were started in 1921 at Davis to determine (1) the effect of dormant pruning on vine growth, (2) the effect of crop on vine growth, and (3) the effect of dormant pruning on fruiting. After the discovery of the beneficial effects of decreased pruning on growth and fruiting the investigation was broadened to determine the possibility of retaining those benefits with types of pruning which are less severe than most of those in general use but are still commercially profitable. The author finds that the retention of a larger part of the yearly growth on the vine combined with some method of thinning offers promise for improved quality and yield in many table grape varieties. Different varieties should receive different treatment. Thus short pruning cannot be improved on for Malaga and Tokay, but Muscat of Alexandria and Hunisa responded well to the longest (cane) pruning practicable. Such pruning brings about a large increase in the number of leaves early in the season, which when accompanied by flower-cluster thinning increases the ratio of leaves to flower clusters, with consequent better nutrition of the flowers. Suitable thinning is not only a necessary complement to longer pruning, but is of value in many cases where longer pruning is impossible or unnecessary. The usefulness of *flower-cluster* thinning for quality is limited to varieties which have loose or straggly clusters or set shot berries or both, under conditions of normal pruning. *Cluster* thinning means the removal of clusters after setting of the berries. It does not influence the number of berries to a cluster or change the character of the remaining clusters. Its chief result is an improvement in quality, primarily through its influence on uniformity in size of cluster and berry and on colouring. *Berry* thinning can improve quality when berries are too dense in the clusters, and its use is limited to varieties setting very compact clusters. For the varieties examined the following recommendations are made :—For Muscat of Alexandria, Hunisa and Dattier de Beirut cane pruning and flower-cluster thinning, for Molinera (Red Malaga) long spur pruning and flower-cluster thinning, for Malaga long spur pruning and cluster or berry thinning, for Emperor cane pruning and cluster or flower-cluster thinning, for Ohanez (Almeria) cane pruning and flower-cluster or sometimes berry thinning, and for Tokay long spur pruning and berry or cluster thinning. The reasons for these recommendations and their application to other varieties are discussed. A warning is given against longer pruning of any variety which is already producing full crops without also thinning, since this will result in overbearing and production of poor quality fruit.

39. JACOB, H. E. 634.8-1.542.24  
**Girdling grape vines.**  
*Calif. Agr. Ext. Circ.* 56, 1931, pp. 18.

The author deals particularly with Thompson Seedless (=Sultana. Perold) and with Black Corinth (=Patras currant. Perold), and advocates the removal of a complete ring of bark from  $\frac{3}{32}$ – $\frac{3}{16}$  inches wide. He considers that by proper attention to thinning and irrigation and by the avoidance of overcropping, vines on fertile soils may be girdled for several years without weakening and may be induced thereby to set a good crop. Thompson Seedless should be



girdled only when grown for the production of table grapes (not for raisins), the operation should be done on the fruit canes when the berries are  $\frac{1}{4}$  grown and should be followed by thinning. He also advises the girdling of Black Corinth on the trunk when in bloom. (Perold in "A treatise on viticulture" also stresses the necessity for girdling this vine, but considers that it should not be done on the trunk as being too weakening.—ED.)

40. DEGRULLY, L. 634.835.094  
Un hybride qui produit d'excellent vin. Rupestris  $\times$  Oeillade de Pierre Castel  
19637. (A hybrid which produces excellent wine.)  
*Progr. Agr. Viticole*, 1932, 97 : 205-10.

The article includes the opinions of several experts on the growth of the vine and its product. These are uniformly good. It is not highly productive, but will apparently grow in poor soil, appears pretty resistant to mildew and to attacks of eudemis and cochylis. Growing on its own roots it has so far been resistant to phylloxera. It might show quicker regeneration after spring frosts. Juice very dark. The wine is said to be comparable to that of a good burgundy or châteauneuf du pape. It certainly seems to have received more praise from a highly critical body of experts than the vast majority of direct producers of which so much is heard, but very little good.

41. SAVAGE, C. G. AND WHITE, H. G. 634.521(94.4)  
The Pecan nut. Its history and progress in New South Wales.  
*Agr. Gaz., New South Wales*, 1931, 42 : 882-8.

Introduced into New South Wales about 40 years ago. The largest tree is from 50-60 ft. in height with a spread of 40 ft. Its average crop for the past 5 years has been 60 lbs., equal to a gross annual return of £2 10s. Seedling trees planted at the Dept. of Agr. Narara Viticultural Nursery in 1915 first fruited in 1929. Worked trees of named varieties planted a year later came into bearing when 6 years of age. The nuts of the seedling trees are considerably smaller than those of the named varieties. The methods of propagation giving most success are whip and tongue grafting during late winter or early spring, and patch and ring budding during the summer. Care must be taken to see that the graft or bud is securely tied. After framing, no pruning is required other than thinning out overcrowded growth, the nuts being borne upon terminal shoots. The trees should be framed with a head about 4 feet above the soil. The main arms should be cut back during early years in order to force out secondary arms towards the base of the main arms and so build a strong framework into the tree. The nuts are harvested when they fall from the tree; those that remain may be brought down by slightly jarring the branches.

42. ZIMMERMANN, A. 634.55  
Der Mandelbaum und seine Kultur. (The almond and its cultivation.)  
*Tropenpflanzer*, 1931, Bd. 28, Beiheft 1, pp. 116, bibl. 111.

A careful symposium of the known facts regarding almond growing for nut production in different parts of the world. The plant would appear to have originated in Turkestan, Persia or not far from the shores of the Mediterranean. There are now very numerous varieties possessing extremely mixed characteristics, the main classification for commercial purposes being into bitter and sweet almonds and into soft and hard shelled almonds. They are also distinguishable by shape and size of nut, by the presence or absence of an inclination to form one or two seeded fruits, by taste and by consistency. Lists of the most popular varieties in the chief producing countries are given. Soil and climatic exigencies are discussed, after which the author deals with the whole process of cultivation from the preparation of the soil to the final product and its use. Although Sprenger and Minangoin observe that in Italy and Morocco respectively certain varieties come so true from seed as to allow the use of reproduction by seed, most authorities consider it necessary to work on particular rootstocks. Vegetative propagation of the latter is not mentioned, but the following stocks are recommended by different authorities:—the peach in South Africa, the common plum and *Prunus spinosa*, the last named for dry stony soils,

while the possibilities offered by *P. Davidiana* for alkali soils and certain local almond varieties for the possession of drought or hot wind or alkali resistant characteristics are noted. Unfavourable comment is passed on apricot as a stock and on Myrobalan, the latter being condemned as poor rooting. Care in planting is essential, owing to the incidence of self-sterility in many varieties. Zimmermann reviews the physiological disorders as also the pests and diseases to which the almond is subject and gives notes on the control of the more important. He deals with the harvesting and preparation of fruit for market, the economics of almond production and gives an interesting account of the uses to which the fruit, shells, and other products are put. Statistics of production from 1926-1929 in the most important producing countries are given and an adequate bibliography concludes the article.

43. WHITEHOUSE, W. E. 634.574

**Pistache nuts are a promising crop for some sections of U.S.**

*Yearbook of Agriculture for 1931*, U.S. Dept. Agr., pp. 432-5.

This expensive nut is exported in large quantities from Syria, Italy, India and Persia. The edible nuts of commerce are *Pistacia vera*. This grows wild in the foothills of the mountains bordering Southern and Eastern Russian Turkestan, and is widely cultivated in Sicily, being worked on the wild *P. Terebinthus*. The two objections to the nut are that they are often very small and that many have closed shells difficult to open. The last phenomenon is apparently associated with growth. When conditions are favourable for rapid growth of the seed or kernel, a greater percentage of splitting occurs. The pistache is dioecious and pollination is necessary for the development of the seed or kernel. In the author's opinion the cultivation of the tree might well prove profitable provided that adequate pollination by suitable varieties and proper cultural methods were previously determined by experimental work.

44. VAN WYK, D. J. R., AND NAUDE, C. 634.58

**Bleaching of peanuts (*Arachis hypogaea*).**

*Farming in South Africa*, 1932, 6: 471-2.

The dark colour of the shells due to adherence and action of the soil of origin is apt to spoil market values. After the trial of a surprisingly large number of bleaching substances, which either did not bleach or failed to remove the soil, the following recommendations were made by the writers, who belong to the division of chemistry. Wash nuts with a brush in water for 5 minutes, remove and wash also with a brush in 2% solution of sodium bisulphite for 5 mins., wash thoroughly, preferably in running water, dry in sun on fine meshed wire netting. Zinc tanks, being affected by the solution, should not be used. The amount of nuts should be 1 lb. per 1 gallon solution and the latter can be used 15 times or possibly more without changing. The amounts of sodium bisulphite adhering after washing in clean water were found to be negligible, e.g. 0.019, 0.021 and 0.018 calculated in total weight of peanuts, shells and nuts. The treatment should only be given to whole unbroken-shelled nuts.

### CITRUS AND SUB-TROPICAL FRUITS.

45. LUSS, A. I. 634.3(52)

**The cultivation of citrus plants in Japan and in the adjoining countries of S.E. Asia.** [Russian-English summary.]

*Bull. Appl. Bot.*, 1931, 26: 1: 141-240, bibl. 66 in Latin characters.

The cultivation of citrus in Japan and S.E. Asia is considered with a view to the application of the methods there in use, which have stood the test of ages, to the cultivation of groves on the Caucasian Black Sea coast where the climate is analogous to that of Japan. The essential needs are the production or introduction of a cold resistant citrus and the employment of any methods

which might increase that resistance or protect against cold. A number of cold resisting varieties are suggested, including *C. Unshiu* Marc, *C. Junos* Tanaka, *C. latipes* Tanaka, and others. The example of Japan shows that with proper cultivation even reputedly tender varieties may be greatly increased in hardiness. Fourteen points of horticultural practice in use by the Japanese which the author considers should be applied to Russian plantations are enumerated. They do not appear to differ in any way from the accepted methods of western cultivation.

46. KOZHIN, A. E. 634.3(47) : 016  
**Citrus plants and their cultivation in U.S.S.R.** [Russian-English summary.]  
*Bull. Appl. Bot.*, 1931, 26 : 1 : 241-540, bibl. 1067 in Latin characters, 467 in Russian.

The main questions considered here are :—the origin of citrus plants and their introduction into European cultivation—the systems of the genus *Citrus*—a description of the most important citrus hybrids, and of those related forms of *Aurantioideae* which might be of possible use as rootstocks for breeding purposes—the economic importance of the citrus family and its cultivation in Russia. The systematic arrangement of *Citrus* needs straightening out : there is still confusion between the systematist's idea of a species and that of the horticulturist who is not confined to those categories of peculiarities which play the principal rôle from the point of view of the systematist. There is no horticultural system of citrus classification which would assign to one species such differing varieties as the lemon and the citron, or the sweet and the bitter orange. The systematist of cultivated citrus can only hope to find his way through the maze of species, varieties, strains and mixtures after a complete study of the genetics, biochemistry, physiology and karyology of the race. The systems of *Citrus* nomenclature of a number of systematists are then discussed and their points of variance noted. The author criticizes particularly the alleged tendency of Tanaka\* to include as species both forms having as much latitude as is allowed to a true Linnean species and others confined within those exact limits which constitute a garden species. It is contended that a species should be, as is the Linnean, genetically an aggregate unit, the result of a whole system of elementary forms, which, continually crossing with one another, keep within the limits of definite specific characters, and that Tanaka's attempt to assign specific rank to those varieties, often seedless, which cannot even reproduce themselves true to type without the interference of man, is unsound. Of the systems so far propounded those of Guillaumin and Swingle are the most logical.

47. TANAKA, T. 634.32  
**The discovery of *Citrus tachibana* in Formosa and its scientific and industrial significance.** [Japanese-English summary.]  
*Communication from Hort. Inst. Taihoku Imp. Univ.* No. 19, 1931, being reprint from *Studia Citrologica*, 1931, 5 : 1-20, bibl. 27.

The small yellow fruited *Citrus tachibana* Tanaka, has been long known as a wild plant in Japan, and has been so found only in those regions whose temperature lies between 14° and 19° C. The climate of these districts makes them the most important horticulturally in Japan. *C. tachibana* thus forms an excellent indicator as to climatic suitability for certain classes of plants. *C. tachibana* was not reported from Formosa till 1930. The author subsequently conducted a survey of the localities occupied by the plant in that island. It is found in association with *Machilus Kusanoi* and other lauraceous evergreens, *Quercus* spp, *Libocedrus*, and *Pinus Massoniana*. No typical sub-tropical plants such as *Ficus retusa*, etc., are found with it. Trees attaining over 12 ft. are common and in places the species monopolizes large areas at a density of 3 plants to 19 sq. ft. It is the most conspicuous example of the wild occurrence of citrus ever recorded. The zone covered by the plants in Formosa is over 1.2 million acres. It consists of mountainous country not too steep for fruit planting, at present lying unused in the possession of the aborigines. Its development if scientifically planned would bring in a large revenue.

\* Tanaka, T. Contribution to the knowledge of citrus classification Nos. 1 and 2. *Studia Citrologica*, Vol. 3, No. 2, Nov., 1929.



48. WILLIAMS, G., AND PREST, R. L.

634.3

**Citrus culture.***Queensland Agr. J.*, 1931, 36 : 492-508.

An article covering the whole subject, adapted to Queensland conditions, beginning with the choice of a site and the clearing of the land. It is recommended that only a few varieties be grown. The selected orange varieties are Washington Navel, Joppa, Byfield Seedless and Late Valencia. The only mandarins suitable at present to all localities are Beauty of Glen Retreat, Emperor and Scarlet. Of grapefruit, Marsh and Duncan are recommended with a preference for the latter. The writers are not enthusiastic over the prospects of lemon culture, since the demand is not likely to increase. Lisbon, Genoa and Villa Franca are the best lemons. Emphasis is laid on the necessity of using only properly selected budwood. The stocks recommended are seedling sweet orange and the Bergamot or common lemon. The sweet orange is particularly adapted to deep, light soils of basaltic texture, and gives much greater longevity. The common lemon should be used for grapefruit and lemons. Queensland citrus is fit for use long before it has reached the depth of colour required by the market. It is necessary for the fruit to be artificially coloured if the early market, the only paying one for Queensland citrus produce, is to be reached. Instructions are giving for effecting this artificial colouring easily and simply by means of ethylene gas.

49. HARCOURT, F. G.

634.337

**The lime industry.***Reports on the Agricultural Department, Dominica*, 1929-30, pp. 13-18, and 1930-31, pp. 9-10.

In 1926 and 1928 hurricanes did severe damage to the seedling lime trees, completing the havoc already being wrought by withertip and red root, the spread of the latter disease being still further assisted by the loosening and twisting of the roots during the storms. Limes budded on sour orange stock, however, withstood disease and stood up well against hurricanes. At the Lime Experiment Station none of the bearing limes on sour orange stock have been uprooted by wind or attacked by root disease, although the seedling limes all round them have succumbed. The yield from these budded limes has been much greater than that from the seedling trees, while the acid content of the limes was slightly higher. The superiority of the budded plant is so apparent that planters are no longer growing seedlings. Limes recently introduced, which are resistant to withertip, are Bears' Seedless, Tahiti and the Woglum lime and *Citrus aurantifolia*. These approximate most closely to the West Indian lime in fruit character. On analysis the oils of Woglum and *Citrus aurantifolia* were reported to be somewhat inferior to the best hand pressed West Indian lime oils, but to be very marketable, providing assurance of adequate supplies could be obtained. Hybrids have been raised by cross pollinating *C. aurantifolia* and Woglum lime with the West Indian lime and so far, although in a withertip area, these have proved immune. It is too early yet to draw definite conclusions. On September 1st, 1930, the worst hurricane in living memory struck Dominica and almost completely destroyed thousands of the remaining seedling limes on the island. It is noteworthy that the sour orange stock again withstood the storm and definitely demonstrated its suitability for use in the hurricane zone.

50. HALMA, F. F.

634.3-1.535

**The propagation of citrus by cuttings.***Hilgardia*, 1931, 6 : 131-57, bibl. 12.

The citron and lemon are propagated easily from cuttings, but the sweet orange and grapefruit have been considered difficult. The following method was used successfully by the author to root the two latter. The material consists of twiggy shoots taken only from healthy vigorous trees. The lower two or three leaves are removed, leaving three or four leaves on the cuttings, retention of the leaves being essential for satisfactory results. The degree of slope of the basal cut appears to have some relation to the number of roots produced, the rule being the steeper

the slant the fewer the roots, the straight cut across producing the greatest number of roots. The cuttings are planted in sand in a glass covered and shaded propagating frame. To keep the leaves turgid a high humidity must be maintained by keeping the frames "close" and giving frequent sprinklings of water. Bottom heat is necessary in cool weather for orange and grapefruit, a sand temperature of 75-79° F. giving satisfactory results. In two or three months the plants will have developed fairly extensive root systems and after hardening off may be transplanted directly to the nursery. In rootstock investigations it is necessary to have plants representing combinations of rootstock and scion of known varieties. A rapid and satisfactory method of achieving this within one year consists of tongue grafting together two leafy twigs representing the desired stock and scion varieties, tying the graft with raffia and treating the grafted twig as a cutting in the manner already described. The graft unites within two weeks, the rooting of course depending on the stock variety. However, once the plants are established, the rate of growth seems to be governed by the scion variety. The rootstocks of mature trees are needed for several lines of investigation. Several methods of propagating these are described, which mostly failed when applied to citrus. The author finally devised a method which is simple and satisfactory. A healthy leafy citrus twig of the type used for cuttings is grafted on to a root piece 10-15 cm. long and 1 cm. in diameter. Bark grafting is to be preferred, if suitable root pieces are available. The union is tied with raffia but is not sealed and is then planted in the propagating pit, and treated as a cutting. The leafiness of the scion has a beneficial influence on the root development. If the plants are needed for the purposes of studying rootstock strains, sprout growth from the stock may be induced by cutting off the scion. This often leads to the death of the stock, especially if the subject is under two years old. A safer proceeding is to sever one of the young roots and to raise the cut end of the detached piece above the ground. It will probably develop shoots and there is the added advantage that by this method the mother plant remains available for further use. Experimental evidence is given to show the importance of the leaf in propagation of citrus by cuttings, the area and green weight of leaf being found to be positively correlated with the amount of roots produced. It has not, however, been determined whether the root activity is initiated by food stored in the leaf or by immediate availability of photosynthetic products made in the leaf.

## 51. CAMP, A. F.

634.3-1.53/54

**Citrus propagation.***Univ. of Florida Agr. Exp. Sta. bull.* 227, 1931, pp. 48.

Deals with the propagation of citrus from the point of view of the nurseryman and grower in Florida. The most reliable rootstock is sour orange raised from seed, and should always be used if possible. The peculiarities of this and other rootstocks are outlined. The whole process of propagation from sowing the seed for the rootstock to its budding and final transplanting is minutely described and photographically illustrated. Notes are given on topworking, and inarching, the latter process being used for the purpose of supplying a diseased or top heavy tree with a new set of roots. The rooting of cuttings is briefly noticed but is considered to be of no commercial value at present.

## 52. BENTON, R. J., AND STOKES, W. B.

634.3-1.83

**The value of potash as a fertiliser for citrus trees.***Agr. Gaz., New South Wales*, 1931, 42 : 889-92.

A report of an experiment to test the value of potash as a fertilizer for citrus trees conducted since 1922 at Narara on Valencia Late, now planted 18 years. The trees are regular in size. The soil is a fairly dark-coloured sandy loam. Seasonal conditions throughout the test have been erratic. There are 3 plots, each of 14 trees. Each has received 5 lbs. bone dust and 5 lbs. of supers. in two applications yearly since 1922, while two of the plots have received in addition 4 lbs. sulphate of potash (or in one case 4 lbs. muriate up to 1924, and then sulphate). In 1925 each tree received 4 lbs. of sulphate of ammonia. Since 1927 half the trees on all plots have received an additional 5 lbs. of sulphate of ammonia. The yields indicate that the size of

fruit has been greatly reduced where potash has been withheld. The setting of fruit was not affected. The effect of potash on appearance of fruit was not significant, for while the number of coarse skinned fruit was actually greatest from the plots receiving potash, it appears almost certain that coarseness is really related to size of fruit. No difference in eating quality was discernible. The Chief Chemist after analysis reported that there was nothing to indicate that the application of potash had been of any benefit; on the contrary the total sugars were definitely depressed and the non-sugars increased. Calculations from the actual returns show, however, that withholding potash resulted in a loss over the 8 years of £29 8s. per acre on these plots.

53. SHILL, A. C. 634.3 : 632.944

**The respiration of citrus as affected by hydrocyanic acid gas fumigation.**

*Univ. Calif. Publ. Agr. Sci.*, 1931, 5 : 167-80, bibl. 14.

Hydrocyanic acid fumigation has been in fairly common use against citrus scale insects for many years. The writer, who endeavoured to simulate field conditions as far as possible, summarizes his results as follows :—The fumigation of citrus with a dosage of HCN approximately that used in the field produces an initial increase in respiration (average about 75 %) followed by a return to an approximate normal value after about 35 hours, the respiration throughout being under conditions prohibiting photosynthesis. Since the subsequent respiration does not markedly decrease below the normal value, it seems that with the dosage used in the field there is no permanent toxic effect on the trees. Higher dosage indicates a toxicity. (Author's summary.)

54. NELSON, E. M. 634.31-2.951.23 : 577.16

**Oranges impaired in vitamin C content by arsenical spray.**

*Yearbook of Agriculture for 1931*, U.S. Dept. Agr., pp. 416-8.

Comparisons of the juice of oranges sprayed at least 10 times during the growing season with arsenates with that of oranges from unsprayed trees showed that the amount of citric acid was markedly less in the juice from sprayed trees, and although the amount of total sugars was about the same, the nature of the sugars had been changed. Experiments with guinea pigs showed also that vitamin C potency was always very greatly reduced in juice from sprayed trees. The juice and pulp are not, however, contaminated by the arsenic even in extreme cases of over spraying.

55. COPEMAN, P. R. v. D. R. 634.31-1.547.6

**The sugar : acid relationship in oranges.**

*Repr. S. African J. Sci.*, 1931, 28 : 152-7, bibl. 7.

The data gained from the author's investigations and from those of other workers make it clear that a given value for sugar must be associated, within certain well-defined limits, with a definite value for acid and vice versa. Hence, if it be assumed that the magnitude of the ratio provides an index of quality of the fruit, it might readily be accepted that the corresponding value for the acid or sugar content of the juice would possess equal significance as a measure of the quality of the crop. In view, therefore, of the difficulty of an accurate estimate of the sugar content and of the fact that the acidity would be directly correlated with the changes in taste at the beginning of the ripening period, the acidity would form the best basis for a standard. The writer considers that a value of 2.0 per cent. for the maximum value of acidity would serve as a suitable standard for Washington Navel oranges.

56. CALIFORNIA AVOCADO ASSOCIATION. 634.653

***Yearbook of the Calif. Avoc. Assocn. for 1931*, 4803 Everett Avenue, Los Angeles, pp. 256, \$5.**

This yearbook, which until recently contained little more than notes on tours and general activities of the members of the association, has made a considerable advance in its present



issue, and now merits the attention of all interested in avocado growing. Although it would appear from the contents that exact research on the avocado is still in its infancy, the infant shows every sign of health and vigour and its claims are being more widely recognized each year. At present research only touches on the broader problems, which are discussed in this yearbook under the following and other headings:—*Varieties*. A list is given of some 400 varieties, including all names of avocado varieties published in Florida, the West Indies, Hawaii and elsewhere, with notes on the origin and type of 95 of these. The committee's report on recommended lists, Fuerte still heading it, is included. *Rootstock*. Points brought out here are that Fuerte seedling rootstocks are extremely variable. The Mexican can stand cold and hot, dry weather. The Guatemalan can stand some cold and heat, while the West Indian variety likes it hot and damp. Experimental work on the rootstock question is essential and an appeal is being made to the Citrus Experimental Station to start it. *Fertilizers*. Present opinion would appear to favour keeping up the fertility of the soil by growing cover crops in the fall and supplementing in spring with nitrogenous dressings. *Pruning*. This section includes a discussion of the probable results of different pruning methods under Californian conditions. The advice is given that growers should beware in the first season of removing the foliage, whether they top or not, as it is necessary for root building. In the second season watch should be made for strong eyes thrown out close to the bud union and, if one of these grows well, it should be encouraged to do so. *Pests*. Among the most serious mentioned are the various scale insects belonging to the genera *Chrysomphalus* and *Aspidiotus*, thrips, especially *Heliothrips haemorrhoidalis*, and the red spider, *Paratetranychus* sp. Control methods including certain experimental data are given. *Diseases*. Progress of a positive kind, which is described, has been made on the following diseases:—Tipburn, carapace spot, sun blotch, surface rot or Dothiorella rot of softening fruit. Among other diseases discussed are apoplexy, cankers, ring-neck, kink-side, Thompson spot and end spot. *Pollination* (see H.A., 1932, 2:1:58). *Picking and packing*. *Essentials of culture*. *Costs and yields*. *Marketing*. *The avocado in S. Africa*.

## 57. BLATT, R. J.

634.653

**The latest development in avocado growing.***South African Fruit Grower*, 1931, 18:233-7.

The first part of this article was abstracted in H.A., 1:4:379. This continuation discusses the commercial possibilities of various varieties now under trial in S. Africa. It is difficult at this stage to decide definitely on any order of merit, but the following are outstanding sorts which are bound to play a leading part in the development of the avocado industry in South Africa—Fuerte, Nabal, Puebla.

## 58. ROBINSON, T. R.

634.653:581.162.3

**Some aberrant forms of flower mechanism in the avocado.***Yearbook Calif. Avocado Asscn. for 1931*, pp. 107-11, bibl. 6.

Stout's investigations on the avocado had enabled him to class varieties into two groups, viz. Class A in which the "first period" (receptive) flowers open in the morning and the second set (shedding pollen) open in the afternoon, Class B where the receptive flowers open in the afternoon and the pollen is shed only at the second opening of flowers, which takes place usually in the morning of the day following. To ensure pollination, therefore, interplanting of the two groups seemed desirable and was recommended. Instances occurred, however, where the Fuerte was found to produce excellent crops in the absence of trees of the other group. Investigations proved that the opening of the flowers depended largely on temperature conditions. It was found that under cool conditions at the height of the bloom, i.e. seldom in excess of 75° F. and dropping in late afternoon to 65° or even 60°, not only do many flowers open late and carry their stigmas overnight in good condition for pollination the following day, but the whole floral action is less definitely synchronized. Thus the Fuerte shows here abundant overlap of receptive and pollen shedding sets of flowers during a good part of the blooming season, rendering close pollination easy in the presence of insects. It was noted also that several varieties regularly

exhibited aberrant behaviour of flowers in the relatively cool coastal region, where the complete cycle is accomplished in a single opening, the pollen being shed in normal abundance and the stigmas still apparently receptive during this period. Among varieties showing this phenomenon are Nabal, Nimlioh, Trap, Winslowson, Chota, Carlsbad, and Banana Lyon. The last three were not observed except in the single cycle stage, so that it was not possible definitely to classify them, but all the rest normally belong to Class B. Despite the observed instances where certain avocado varieties are evidently not dependent on cross-pollination for fertilization, the author considers that interplanting of reciprocating varieties is normally advisable.

## TROPICAL CROPS.

59. GOVERNMENT OF INDIA. 63(54)  
**Review of Agricultural Operations in India, 1928-29**, Calcutta,  
 1931, pp. 251.

This review covers the whole field of agriculture in India, pp. 60-67 dealing with tea, coffee, rubber and fruit. *Tea*. No cases of good tea growing on soils of low acidity persisting to any depth have been recorded. Experiments on the effect of manures showed that neither large nor small applications of nitrogen, phosphate and potash had any significant effect on the caffeine or tannin content. *Coffee*. Attempts are being made at the Mysore Coffee Exp. Station to produce by hybridizing varieties of coffee which are resistant to root rot diseases. *Rubber*. The discovery that all good yielding rubber trees had latex tubes of above a certain average bore was further developed. The work of classifying plants in the nursery on this basis was extended to 10,000 plants. A dozen writers from different rubber estates were trained in Mr. Ashplant's method of selection. (The merits of these methods are discussed elsewhere, reference being made to them in H.A., 1931, 1:3:289-90.—Ed.) *Fruit*. In Bombay experiments are being made with citrus stocks. The marketing, storage and transport of mangoes is being studied. In the Punjab experimental work in progress includes the irrigation of oranges, the planting of dates, root pruning of Santra oranges. On oranges and grapes sodium nitrate and ammonium sulphate have given better results than organic manures.

60. LAL SINGH. 634.3/7(54)  
**Annual Report of the Fruit Specialist to the Government, Punjab,**  
**for year ending June 30th, 1930**, part II, pp. 15.

Experimental work is reported on pp. 4-9. *Root pruning*. Santra Oranges, subjected to an annual light root pruning during the past 3 years, in every case gave increased yields over the control, the average number of fruits per tree being 250 for the root pruned trees as against 99 for the controls. The vegetative vigour of the trees declined. The trees used were shy bearers with excessive vegetative growth. *Dates*. Experiments have been in progress since 1927 to decide if the general local custom of planting the largest date suckers was justified. The results obtained do not altogether agree with local practice. February appeared to be the best month for planting (as against September in local opinion), while the theories that the bigger the date sucker the better it roots, and that suckers of less than 6 lbs. should not be planted were both disproved.

61. WALTERS, E. A. 631.53/54  
**Plant propagation. The propagation of tropical orchard crops at the Union**  
**Agricultural Station, St. Lucia.**  
*Trop. Agriculture*, 1932, 9: 35-7.

The paper deals fully with the practices of budding and grafting mangoes and avocados and with the propagation of pineapples. Only points of special interest are noted in this abstract. *Mango*. The mango bud is unique in its method of union with the stock

plant, cohesion taking place only under the bark and not at the sides. The bud is thus found to be carried upward on a cushion of rapidly dividing cambium cells. Pruning during the development by the bud shoot of a branch system has been found to check this activity and induce the formation of xylem. It is necessary also to carve off the superimposed bark to prevent the wound gum from the cells in the upper edges of the cortex filtering into the space at the back of the bud and thus preventing a union. *Avocado*. When special varieties are required in a short space of time, avocados can be readily branch grafted and bottle grafted. The method is an adaptation of the approach graft, bottles or test tubes being used to keep the scion fresh. Wild trees treated in this manner have been converted into named varieties and flowered in the second year. In order to induce early fruiting in new varieties imported as seed, double grafting is performed. A piece of mature wood of some local variety is grafted on to the stock of the imported seedling, and is in turn grafted with the seedling's apical shoot. *Pineapples*. A new method of propagation has been worked out by the author which produces a large number of uniform plants of a given variety in a short time. It promises to supersede the much slower standard method of desuckering lateral growths. The pineapple plant, before the formation of the fruit stem, is defoliated up to the top six leaves. The rhizome and aerial stem, freed from roots and scales, is then cut into cross sections not more than  $\frac{1}{2}$  inch thick. These sections carrying 3 or 4 dormant buds are immersed in a 2-5% solution of permanganate of potash for 10 minutes. They are then planted flat in a prepared bed of light soil. After the buds have formed shoots, which should occur in about a fortnight, the sections are lifted and cut into triangular portions each with its own bud. These are again disinfected, replanted and watered with a solution of ammonium sulphate. In a short time the plants have a good root system and are ready for planting out. The development of flower heads in maturing pineapples required for propagation can be prevented by a drop of weak sulphuric acid tubed into the centre of the expanding bud. It is argued that, in view of the fact that young buds are isolated from the parent before pre-fruiting period of dormancy sets in, they should develop into fruit plants equal to or better than the parent forms. 60-80 plants may be obtained from mature stems of one foot in length by this method.

62. PYKE, E. E.

631.53/54

**Vegetative propagation.***Trop. Agriculture*, 1932, 9 : 22-8, bibl. 23.

The principles underlying vegetative propagation together with the advantages and disadvantages of the practice are discussed with special reference to certain tropical crops particularly cacao. In this abstract only those passages referring to tropical crops will be dealt with. The need for a directly uniform type of cacao may not be so obvious as in the case of directly edible fruit, nevertheless the propagation of a good bean type would be of great value, as cacao after picking undergoes a series of technical processes in which uniformity of bean in size, chemical composition, texture, thickness of shell, etc., is highly desirable, in fact in cacao uniformity may represent an important factor of quality. In cacao too a series of clonal rootstocks worked with scion clones would yield valuable information on the degree of drought resistance of different cacaos and its correlation with cropping and premature wilting of crop. The increase of the environmental range of a tropical crop when vegetatively propagated is well illustrated by the case of *Cinchona Ledgeriana*, which on its own roots can only be grown successfully on virgin land but when grafted on *Cinchona succirubra* grows well over a wider range of territory and on poorer soils. In tropical crops delicate "improved" varieties are still rare, the plants being still very near the wild forms, but as in course of time improved varieties are bred, they will undoubtedly need the assistance of sturdy rootstocks as much as do the temperate fruits. In cacao there are several varieties which might be rendered harder by working on to clonal rootstocks. Seedless crops such as Marsh grapefruit and Washington navel oranges, must of necessity be propagated asexually. Seedless sapodillas sometimes occur but no method of vegetative propagation has yet been used to extend such varieties. (In Java choice varieties of sapodillas are habitually budded by the Forkert method used for rubber, or splice, cleft or side grafted on to seedling



varieties and also on to *Mimusops Kauki*, L. See *Fruits and fruit culture in Dutch East Indies*, by J. J. Ochse: G. Kolff & Co., Batavia, 1931.—ED.) There is a belief among planters that cacao trees raised from "chupons" do not develop a tap root and are therefore useless. These basal suckers however develop main roots with a function exactly similar to a tap root and the prejudice against them would appear to be unfounded. The author has found that cacao raised vegetatively, both root shoots from stools and layered stems, has developed sturdy main roots similar to the tap roots of seedlings. In dealing with the subject of degeneration through senescence of vegetatively propagated clones, it is contended that this theory has never been proved, though it has been discussed for over a century. In the case of cacao a moribund old tree may be regenerated from basal suckers which become no less vigorous and fruitful than the old tree. Many of the best bearing trees in the older Trinidad plantations are probably regenerated chupons from trees that would now be aged at least 150 years. Deterioration by bud mutation within the clone, however, such as is liable to occur in citrus, is a danger which would require attention. The phenomenon of self-sterility has to be considered in planting up a vegetatively propagated orchard. In crops such as bananas and citrus that develop the fruit in the absence of seed self-sterility may not matter, but in a seed crop such as cacao partial sterility would be serious. The existing varieties of cacao have a high degree of self-fertility but doubtless as breeding progresses improved varieties will exhibit some degree of self-incompatibility which will be countered, as in deciduous orchards, by interplanting mutually compatible varieties.

63. OCHSE, J. J. 631.535.3  
De zgn. bleek- (etiolated) stekmethode. (The etiolation method of propagation.)  
*De Bergcultures*, 1931, 5 : 681-3.

A description of a quick way of propagating plants vegetatively on a large scale which the author states he has derived from the methods in use at the East Malling Research Station and has adapted to the requirements of the tropics. The method is to cause shoot formation on layered branches to take place in the dark, so that the bases of the shoots are etiolated. The plants to be propagated are planted out in a slanting position making an angle of 40° with the ground. When they have become established they are bent over and pegged down in a shallow trench running along the row. As soon as the buds are about to swell the layers are covered with about 2½ cm. of soil; on the growing shoots attaining a length of 7-9 cm. they are again earthed up, and this is repeated as growth proceeds, until the soil is 15 cm. deep. The shoots will be rooted by the winter and are then removed from the layers, which are left uncovered till their buds again begin to swell. Shoots which have not rooted, or are not required, can be laid in with the old layers and the beds can thus be maintained for years. It is essential that the soil covering the shoots should not be allowed to wash away, since success depends on the bleaching of the lower part of the shoots, nor must earthing up be deferred until the shoots are in growth. The crops which have responded to this method in Java up to the present are varieties of citrus, Nephelium and tea, but the author considers that this is merely a beginning. The article is illustrated by 4 photographs showing the method as practised at the Ragoenan Experiment Station, Java. (Full translation available.)

64. KHANNA, K. L. 633.584.5  
Some observations on bamboos.  
*Ind. J. Agr. Sci.*, 1931, 1 : 473-9, bibl. 4.

Varieties of Bamboo Tulda and Balcooa Watt, the species commonly met with in Bengal and Behar, belong to the class of bamboo of which the length of life is perfectly fixed so that all plants derived from one clone flower and die at the same time although not of the same age, including even those recently raised from cuttings. The length of life however may exceed 100 years. In the plants under observation even underground rhizomes putting out their new

shoots also wither and die in a short time after the death of the parent plant, and in one plant the new shoots began flowering a week after emergence from the ground. Rejuvenation in bamboos therefore is only possible by raising them from seed. Owing to the infrequency of flowering bamboo seed has a very high percentage of germination and remains viable over a long period. The best results are obtained, however, by sowing the seed just after it is mature. Germination takes place about 12 days after sowing. The fact that the seed coat remains attached to the plant for a considerable time is of great help in distinguishing the mother shoot. The seedling develops by underground branching in one direction only, each succeeding shoot arising from a rhizome below the surface formed by the preceding bamboo shoot at ever increasing distances from the mother plant and at a greater depth. The new shoots above ground are progressively thicker, higher, and have longer joints than their predecessors. The root system of bamboo seedlings is similar to that of sugar cane seedlings, but the first formed roots have a longer life, having been traced functioning 4 months after the sowing of the seed. Each new shoot arising from the clump produces its own new set of adventitious roots. The root system of plants propagated vegetatively consists of a heavy mass of whitish-brown roots, the ends terminating in masses of very fine hair-like branchlets, the whole penetrating the soil to a depth of 60 cm. The lateral spread is about 8 ft. depending somewhat on the texture of the soil. Bamboos growing near the river have been found to have a greater lateral root spread than those in drier situations.

65. NORRIS, R. V.

633.72-1.521

**Establishment of tea seed gardens.***Tea Quarterly*, 1931, 3 and 4 : 98-9.

A discussion of Paragraph 139 of 18th Report of the Imperial Economic Committee. This paragraph recommends that immediate steps should be taken to establish at high elevations tea seed gardens for the supply of seed of highest proved quality and that such work should be the responsibility of the Government. It is pointed out by the author that the scheme, to be of value, would take years to bring into being. The jats of tea now grown are of highly mixed ancestry and much time would be needed to breed out pure strains. These, if obtained, would still require testing in regard to their suitability for different tea areas, and the quality of tea to be derived from them. This again would take a long time. If the Committee mean that tea should be laid down with seed from existing jats, the relationship between jat and quality is still an obscure problem and a number of different jats would have to be used to provide for different areas and elevations. The establishment of such gardens at high elevations as recommended by the committee would not provide for the needs of low and mid-country, where future developments are more likely to take place. The author is of the opinion that the idea is unpracticable, but considers that much more could be done to establish nurseries of pure strains by means of vegetative propagation. Once the selection of suitable varieties had been made, the multiplication of uniform varieties could go forward rapidly. It is suggested that clonal propagation already being tested in Java (H.A., 1931, 1 : 4 : 386) should be thoroughly investigated.

66. STOUT, W. G.

633.72

**Onderhoud van theetuinen in tijd van laagconjunctuur. (Upkeep of tea gardens during commercial depression.)***De Bergcultures*, 1931, 5 : 1431-2.

It is suggested that costs could be reduced by pruning the tea in such a manner that the breadth of the bush is not much reduced and the gaps between the bushes are in time eliminated. When this state has been arrived at, pruning is not required for two years, weeds are kept naturally in check, while the soil surface neither dries out nor becomes eroded. Any slight inferiority of leaf caused by this method can be counteracted in the manufacture. When the trees are pruned again the prunings will be sufficient to provide a ground cover against sun and rain until the

bushes have once more grown together, a process which takes about 5 months. A certain amount of weed control is needed during these 5 months but not afterwards. The author does not recommend replanting at present where plants have failed. He says that the gap caused by the missing plant is soon covered by the others near, and since so much success is being obtained in the vegetative propagation of tea, high-class varieties will soon be available for replacements and should be waited for. (Full translation available.)

67. TUBBS, F. R.

633.72 : 581.148.2

**Defoliation.**

*Tea Quarterly*, 1931, 3 and 4 : 106-7, bibl. 3.

In view of their interest to tea research workers, the author first examines certain results of insect defoliation of deciduous crops as noted by workers with that material. It is recognized however that the conclusions they draw may not be with certainty applied to tea, which is evergreen. Harper (*Ann. Bot.*, 1913, 27 : 261) found that larch was killed by the cumulative effect of defoliation by the larch sawfly. In this case a second crop of leaves appeared before winter, but was unable to manufacture sufficient reserves. Magness (*Bull. Oregon Agr. Coll. Exp. Sta.*, 1917, No. 139, pp. 46-77) found among other points that with apples the removal of the subtending leaf resulted in the formation of a very weak bud, which either remained dormant or only produced weak growth the next season. This point is of interest in relation to the plucking of tea and is under investigation at the Institute. A tea bush kept completely defoliated from August, 1930, has, in November, 1931, begun to die back from the tips of the branches, no growth of stems in thickness or length having occurred. Experiments are now being made to study the effect of defoliation for varying periods upon wood growth and flush of tea.

68. PRILLWITZ, P. M.

633.72-1.589

Het gebruik van asfaltpapier bij Theecultuur. (**The use of mulch paper in tea cultivation.**)

*De Bergcultures*, 1931, 5 : 705-6, being *Korte Mededeeling van het Proefstation voor Thee*, No. 136.

In view of the increase in crop yield in the case of annual crops obtained in Hawaii by the use of mulch paper, an experiment was laid down at the experiment garden at Pasir Saronggé, Java, to test the effect on the growth of young tea. The ground was newly cleared forest land, 1,000 m. above sea level, with light sandy soil. The annual rainfall was 3,000 mm. and the average daily sunshine 5 hours. The plots were lightly shaded by *Albizia falcata*. The paper used was Gator-Hide mulch paper in a thick and a thin variety! The tea was planted in rows, over which was laid mulch paper 90 cm. in width, holes being made in the paper for the plants to pass through. A cover crop *Crotalaria usaramoenensis* was sown between the rows. 8 months after planting no difference in height or colour could be found between the plants on covered and on the uncovered control plots. The use of the paper for shading the ground is unnecessary in view of the fact that permanent shade can quickly be grown, and, since it apparently has no effect on the crop and is very expensive, its use cannot be recommended for tea. (Full translation available.)

69. TUBBS, F. R.

633.72-1.542

**Pruning terminology.**

*Tea Quarterly*, 1931, 3 and 4 : 101-2.

Definitions, arrived at after consultation with prominent planters, are given of the various terms used to describe different types of pruning in use on tea. It was felt that, with the initiation of pruning experiments at the Tea Research Institute, clear definitions of the terms likely to be used were essential. The following types of pruning are defined :—centring, collar pruning, clean pruning, umbrella pruning, rim lung pruning, cut across, Travencore, bagjan, skiff.



70. VAN HALL, C. J. J. 633.73  
**A review of the most important publications on coffee issued in the second half of 1930 and in the first half of 1931.**

*Int. Rev. Agr.*, 1931, 22 T : 419-36, bibl. 49.

The method adopted is to take each coffee growing country in turn, to give a short description of any conditions reacting on coffee peculiar to that country, such as climate, cultivation methods, etc., and to summarize very briefly what has been written on its coffee in the period stated in the title, complete references being given at the end of the review. Work on the botanical side is then noticed, special attention being called to the work of Hille Ris Lambers on polyembryony and polyspermy. Publications concerned with cultivation are next dealt with and the author's own work on selection concisely described. The review ends with a summary of the recent work on preparation of the bean. An analysis of the origins of the 49 references cited, which refer only to the period in question, reveals that of these 15 were Dutch, 11 Belgian, 8 American, 8 French, 3 English, 3 Portuguese and 1 Italian.

71. WELLENSIEK, S. J. 633.74 : 581.143  
**De erfelijkheid van zaadlobkleur bij cacao als basis voor qualiteits selectie.**  
**(The genetics of cotyledon colour in cocoa as a basis for quality selection.)**  
 [English summary.]

*Archief v. d. Koffiecultuur in Ned. Indie*, 1931, 5 : 217-33, bibl. 12.

White cotyledon colour in cocoa is pre-requisite for a finished product of superior quality. Selection for this characteristic is necessary, but hitherto data on the genetics of cotyledon colour have been entirely lacking. Investigations in Java, which have recently reached a stage where analysis is possible, have shown that crosses between coloured and white in either direction yielded a coloured F<sub>1</sub>, thus indicating that colour is dominant. The segregation in a number of tests was on approximately a 3-1 basis in F<sub>2</sub>. Data are given which justify the conclusion that the difference between coloured and uncoloured is on a monogenic basis. The genetics of cotyledon colour form a very simple basis for quality selection, since the characteristic of uncoloured cotyledons is recessive and therefore breeds true.

72. PETYAYEV, S. J. 633.85  
**Aleurites—tung trees and their cultivation on the Caucasian Black Sea Coast.**  
 [Russian, short English summary.]

*Bull. Appl. Bot.*, 1931, 26 : 1 : 1-76, classified bibl. 401.

A very complete account of the tung oil tree. The account opens with a botanical sketch of all the known species of *Aleurites* illustrated with diagrams. It then proceeds to discuss the cultivation of the tree in China, in U.S.A. and in other countries. Cultural operations are dealt with under the headings:—propagation, which is by seeds and cuttings, the seed not remaining viable over a year; transplanting; manuring; soil requirements, the tree being described as unexacting provided the soil is efficiently drained; climate; harvesting. Several pages are devoted to problems connected with germination. Certain other varieties besides *A. Fordii*, namely *A. cordata* and *A. montana* are recommended for experimental cultivation on the Caucasian Black Sea Coast. Attention is called to the bibliography which is in English and consists of 401 references.

73. BURMA. 633.85  
**Report of the operations of the Department of Agriculture, Burma, for year ending March 31st, 1931**, pp. 41 and appendices.

The cultivation of tung oil (*Aleurites Fordii*) [p. 5] on a plantation scale is being taken up by a firm at Hsum Hsai in the Northern Shan States. The trees already planted are showing excellent growth, and no trace of disease. 750 acres are to be planted at once.

74. HEINTZ, G. V. 633.85  
**The tung oil tree and the tung oil obtained from it.** [Russian-English summary.]  
*Repr. Bull. Appl. Bot.*, 1931, 26 : 1 : 541-95, bibl. 139.

A discussion of the normal methods of growing this tree and of the mechanical extraction of the oil. The author notes that the tree will stand temperatures as low as 14° F. He considers that *Aleurites Fordii* is the only variety worth commercial cultivation. The great variation in productivity of trees of even this variety makes it essential to select very carefully the most productive trees and to test thoroughly the best methods of vegetatively propagating the plant. He gives addresses of six institutes as particularly interested in Tung Oil production as follows:—Florida Agr. Exp. Sta. Gainesville; Bur. Plant Industry, Washington D.C.; Florida State Dept. of Agr., Tallahassee; American Tung Oil Corp., Washington, D.C.; Tung Oil Sub-Committee, Imperial Institute, London; Institut Colonial de Marseille, France.

75. WHITFORD, H. N. 633.912  
**Rubber growing on forestry lines.**  
*India-Rubber J.*, 1932, 83 : 2 : 9-10.

A report of an address by Dr. Whitford to the Singapore Rotary Club. It is claimed that costs can be greatly reduced and the soil either restored to or kept in good condition on rubber plantations, if all weeding is abolished and the undergrowth left to develop naturally. All material, leaves, branches, etc., reaching the forest floor is allowed to remain there and decay, and a rich humus is soon formed. The most prolific of the ensuing undergrowth will be *Hevea* itself. This germinates freely and will endure shade while most other harmful weeds will not. Only two harmful plants will survive this shade, stag moss (*Lycopodium*) and bracken fern (*Gleichenia*); these when met with are pulled up and left to rot. Nature is assisted, if necessary, by the broadcasting of *Hevea* seeds in bare places. Subsequently the best of the young seedlings are helped by the removal of the crowded seedlings round them and then are left to develop naturally, or they may be budded from proved clones. In either case they become tappable trees with a minimum of expense. Old plantations can be renovated by this method while tapping still continues, the old low yielding trees being removed as the self-sown trees reach tapping age. It is recognized that this method will result in an uneven age stand and an untidy appearance and that therefore tapping will not be easy to control. This can be remedied partially at any rate by adopting the contract system of tapping. Since the *Hevea* forest will be continuously and inexpensively renewing itself, bark conservation will be less necessary, for if the yields of tappable trees diminish, fresh trees are constantly coming along to replace them. To support the above arguments the case is cited of a plantation in Pahang where these methods are being carried on with apparent success. It is also pointed out that the natives by adopting similar irregular methods can produce rubber at a very low cost. To sum up it is urged that by the adoption of rational forestry methods the soils will be kept in or near their original condition, thus ensuring continuously large yields at a much lower cost. By the gradual replacement of old or worn out trees a sustained yield is maintained with no additional capital charge. The same methods applied in opening new areas would result in much reduced capital costs.

76. MARKOVITCH, V. V. 633.912 (92+54.)  
**Rubber plants of Java and India.** [Russian-English summary.]  
*Bull. Appl. Bot.*, 1931, 26 : 1 : 77-140, bibl. 159 in Latin characters.

The author having been sent on a tour of the East by the Russian Institute of Applied Botany, reports briefly his observations on the rubber industries there. His instructions, however, were to concentrate on *Manihot*, but he found that *Hevea* was the only rubber crop now grown. However, he took the opportunity to study other rubber producing plants encountered during his travels. Many of these had been already tested in India and Java and he was able to obtain much of the literature on them. In the course of the paper 54 genera of rubber bearing plants are dealt with and a much greater number of species. There is an interesting appendix containing

a list of 296 plants of possible use as rubber producers. In regard to the possibilities of cultivating rubber in Russia the author says that *Manihot* spp. grafted on *M. carthaginensis* should do well south of Sochi, as the latter thrives and seeds itself in the district. Rubber bearing lianas might be cultivated under cover of forest plantations, but short stemmed species could also be so grown, since the trees would form a protection from frost. Instances are given of rubber bearing species, notably *Cecropia*, which have grown with little or no protection at Sukhum and Batum. Of the native Caucasian flora *Periploca graeca* might provide a source of supply.

77. VAN BAALEN, J. 633.912-1.541.11/12  
 Het uitzoeken van moederboomen. (Selection of mother trees.)  
*De Bergcultures*, 1931, 5 : 827-8.

A plea that the selection of high yielding mother trees in *Hevea* for the production of budwood should only be made after the tree production records have been taken for a number of years. The method of choosing a supposed high yielder after a year's observation is faulty, since, if the record of one of these trees is subsequently kept over a number of years, it will often be found to have quite a commonplace average, and that the high yield has only been of a temporary nature. Furthermore, if the history of the mother tree is known over a long period, there is far more opportunity of observing unfavourable qualities, which might escape notice at first sight, but which would none the less be transmitted to the progeny and appear in due course.

78. OSTENDORF, F. W. 633.912-1.541.11/12  
 Het uitzoeken van moederboomen. (Selection of mother trees.)  
*De Bergcultures*, 1931, 5 : 891-2.

A reply to the preceding. It is agreed that a short history of a tree gives no true picture of its peculiarities; on the other hand results can be more quickly obtained by planting out a large number of buddings from supposed high yielders and subsequently eliminating those which do not come up to expectations. This time factor is considered to outweigh the extra trouble and expense of this method. The point that prolonged observation of the mother tree will enable undesirable qualities to be detected is not considered vital. For instance, the correlation between the yield of a mother tree and that of the clone is still quite unknown. Many high yielders produce poor clones; possibly it is a case of the tree only coming into high yield late in life, and if so a long preliminary observation of the mother tree would help very little, since clones yielding late are of little value. Susceptibility to brown bast is probably hereditary, but even this is not at all certain. All things considered data obtained from long observation of mother trees have hitherto been of little practical value, but as the knowledge of the correlation between clone and mother tree increases, so the value of these observations will increase. Investigations on this correlation are now being carried out in Java.

79. BOBILIOFF, W. 633.912-1.541.5  
 Enkele gegevens over hooggeplaatste oculaties. (Some data on high budding.)  
*De Bergcultures*, 1931, 5 : 1200-7.

In 1927 the author delivered a paper in which he mentioned that the number of latex vessels was greater in a rootstock of *Hevea* than in the scion of that stock. From this it was thought that the scion might have an improving influence on the stock. However these deductions were made only on low budded plants and seedling trees were not available for comparison. Publicity was not encouraged in this instance, since it was feared that it might lead to high budding on a large scale with the idea of obtaining a higher yield from the budded rootstock than from the scion imposed on it. The value of this theory can only be proved by a series of careful tapping tests of buddings at different heights and with seedling plants available for comparison. In tests initiated by Dr. Cramer in 1926 at Michiels Arnoldlanden Estate, Java, high buddings were made from two clones on selected seedling stocks, unbudded seedlings of the same strain being retained for comparison. The first tappings are now being made (1931),



and while it is too early to produce definite conclusions, it may be mentioned that so far the budded rootstocks have yielded more than double that of seedlings tapped at the same height. In an estate in Sumatra, where similar tests were made, the yield from high budded rootstocks of unselected material was 25% greater than the yield from seedlings of selected material. Anatomical investigations show many complicated influences which vary with the clone. It also shows that there was no fixed correlation between the number of latex vessels in stock and scion. Sometimes one had more and sometimes the other, while as a rule they were about equal. [It was pointed out in discussion later that a large number of latex vessels does not necessarily mean a high yield.—ED.] Where the number of latex vessels in stock and scion is about the same, they run through uninterruptedly; where the number differs, a sharp interruption in the run of the vessels occurs though some run through both parts. (Full translation available.)

80. O., F. W. 633.912-1.541.5  
*Nieuwe oculatiemethoden voor Hevea. (New budding methods for Hevea.)*  
*De Bergcultures*, 1931, 5 : 1372-5.

Attention is called to an article in the Bulletin du Syndicat des Planteurs de Caoutchouc de l'Indo-Chine of July, 1931, pp. 316-37. Here various methods of budding rubber are discussed and a series of experiments described which have led up to a method considered to have great possibilities. The flap is cut in the usual way, with the hinge at the top. The bud is inserted and a previously prepared galvanized wire ring is slipped down over the flap and tightened up by twisting a loop with which it is provided. It is claimed that this method, even allowing for the preparation of the rings, is very much quicker, both in applying and removing the tie. It has been found that a waterproof tie is quite unnecessary and that the added pressure obtainable by the use of the wire ring results in a higher percentage of successes. Experiments have shown that the best tie pressures for quick callusing are those of 4 kg. or more per sq. cm. This pressure is easily obtained with the wire ring. There is a clear illustration of the ring. (Full translation available.)

81. s'JACOB, J. C. 633.912-1.541.5  
*Over een minder geschikte manier om oculaties te planten. (An unsuitable practice with budded rubber trees.)*  
*De Bergcultures*, 1931, 5 : 114.

Some 3 to 4 year old *Hevea* rootstocks were budded in February and ringed in June with a view to lessening the shock when they were finally cut back a month or two later. Contrary to expectation, though the ringing caused the inserted buds to shoot, they failed to grow and eventually assumed a chlorotic aspect and began to fail. As soon as the tops were cut off at the ring the buds resumed a normal aspect and grew healthily. Examination showed that the bast vessels and the wood above the ring were congested with starch, while below the ring the vessels were entirely free except for a few grains. The theory is advanced that the leafy crown absorbed most of the water that should have supplied the bud, and it is suggested that in future ringing should be omitted as unnecessary and probably quite frequently harmful. (Full translation available.)

82. SHARPLES, A., AND SANDERSON, A. R. 633.912-2.4  
*The root disease problem on old rubber areas in Malaya.*  
*Rubber Res. Inst. bull.* 3, 1931, pp. 43, bibl. 8.

The problem of root disease of *Hevea* in Malaya is becoming extremely serious, the most important being that caused by *Fomes pseudoferreus* Wakef. The earlier theory that the disease attacks only mature rubber no longer stands, since trees only 3½ years old have been found with their roots in an advanced state of decay owing to this fungus. The disease is rendered the more dangerous, in that it is difficult to detect in the early stages, the first sign often being the drying up of the latex flow when it is too late to save the tree. Infection is spread from tree to tree

largely by contact of underground roots. Treatment consists of exposing all the main lateral roots and removing those found to be diseased. This treatment is expensive but effective if done thoroughly. With Chinese labour, on an easily worked soil, the cost was found to be \$2.50 per tree, or, on a basis of 80 14-year-old trees to the acre, \$200 per acre. Tamil labour was used in the latter part of the experiments at a cost of only \$1 per tree. Schemes of treatment are outlined for 3 classes of estate: (1) those where adequate precautions have been taken in the past, (2) those which have not taken adequate precautions but have not yet reached the stage of declining yields, (3) those which show seriously declining yields owing to losses from root disease. In the main the treatments consist of isolating the affected tree, leaving a surrounding guard row of more or less unaffected trees, the removal of all affected roots of the isolated and guard trees, and the digging of a 2 ft. deep trench round the outside of the guard rows to prevent any further spread. When a group of trees has to be isolated, the guard row within the trench is dispensed with. In extreme cases the whole area should be cleared and replanted by degrees, using only budded rubber from high yielding clones. A point to be considered is that it is not yet certain how far replanting in previously infected land will be successful. It is, however, being done successfully on one estate at a very much lower cost than if fresh jungle land had been used.

83. MURRAY, R. K. S.

633.912-1.874

**The green manuring of rubber.***Trop. Agriculturist*, 1931, 77 : 257-76, bibl. 5.

The necessity of green manuring to combat soil erosion and to maintain the fertility of the soil is now universally recognized, although only a few years ago the entire absence of ground cover under the crop was considered essential. The article opens with a short historical account of how this change of opinion was brought about. The most suitable leguminous cover crops for growing under rubber are *Dolichos Hosei*, *Vigna oligosperma*, *Centrosema pubescens* and *Calopogonium mucunoides*. The two former make permanent cover and kill out all weeds, but *Calopogonium* cannot withstand dense shade and dies out as the rubber grows older. It should therefore be mixed with a more permanent cover. Other leguminous cover plants worthy of trial, though not yet extensively used, are *Desmodium* spp., *Centrosema Plumieri*, *Dunbaria Heynei*, *Phaseolus radiatus*. Among the erect green manures *Tephrosia candida*, *Clitoria cajanifolia*, *Crotalaria usaramoensis* and *C. anagyroides* are the best known. The peculiarities of each are then discussed. Since certain cover crops which make a rapid growth at first die off more quickly than those with a slower initial growth, it is desirable when laying down a cover crop to employ a mixture of these two types, so that eventually the slower growing and shade enduring variety will replace that which made the earliest growth. Thus *Calopogonium* should be combined with *Dolichos Hosei*, *Centrosema pubescens* or *Pueraria phaseoloides*. The *Calopogonium* will provide the cover for the first year, and will be gradually replaced by the other species which do not object to growing under the shade of the rubber trees. New clearings should be planted with cover crops immediately after felling or burning, the seed being sown during a rainy period. Some of the erect green manures serve also as a useful check to erosion if used as hedges planted along the contours. It is suggested that loppings should be made from the erect cover twice a year during showery weather and turned into the soil immediately. It has been shown\* that if green manure is allowed to dry on the surface of the soil, nearly 50% of the nitrogen may be lost.

84. DE VRIES, E.

634.441-1.547

**Over periodieiteitsverschijnselen bij den mangga. (Periodical growth phenomena of the mango tree.)** [English summary.]*Landbouw*, 1931, 7 : 259-308, bibl. 22.

A report of investigations made on 9 mango trees at Pasoeroean, East Java, from December, 1925—November, 1928. The climate is of monsoon type with rains from December to April.

\* Joachim, A. W. R. Losses of nitrogen from green manures and tea prunings through drying under field conditions, *Trop. Agriculturist*, 1928, 71 : 348-51.

The relative humidity of the air is lowered to an average of 50% in the dry season. In this paper the term "budding" is used indifferently to denote the shooting of both leaf and flower buds, the two being treated as one single phenomenon. Budding mainly took place in the months of January, April and June. In the two earlier months there was more leaf growth than flower, in the latter more flowers were produced. In July and August a second and even third blossoming occurred, particularly in cases where the first had miscarried. The trees in one particular district frequently bloom simultaneously in great numbers, this flowering being probably influenced by the course of the monsoon. The maximum leaf fall occurs about 15 days after leaf budding and from 20-25 days after the beginning of an inflorescence. Occasionally there was a leaf fall without any preliminary budding, but it has been sometimes found in such cases that a budding was due, even if it did not take place. The observation is of importance in connection with the question as to whether the periodicity is autonomous, i.e. whether there is a tendency to bud or blossom after a certain number of days. An important field for experimental investigation is opened up by the hypothesis that the clones of vegetatively propagated plants have their specific peculiarities as regards the periods that elapse between the various stages of their development. This theory if proved could be turned to account in various ways; for instance early or late flowering clones could be established or those that would quickly produce a second flowering, should the first one fail. Then, too, in view of the fact that recent investigations will probably enable vegetative embryos to be distinguished from the sexual ones in the seed beds, it may become possible to choose stocks for certain clones having a certain rhythm of growth. Also knowledge concerning certain phenomena of periodicity such as the time elapsing between the setting in of the dry season and flowering may be applied in such a manner as to render mango growing more remunerative.

85. CHEESMAN, E. E. 634.772-1.52  
**Banana breeding at the Imperial College of Tropical Agriculture.**  
*Empire Marketing Board publ.* 47, 1931, pp. 35, bibl. 13.

The history of banana breeding at the Imperial College of Tropical Agriculture since the inception of the institution in 1922 is first traced and the peculiar difficulties of the problems outlined. The principal object aimed at is to obtain a variety with the commercial advantages of Gros Michel, but, unlike that variety, immune to Panama disease. The Gros Michel banana sets few seeds when pollinated by certain other members of the genus *Musa*. However, seedlings have been raised by pollinating it with *M. malaccensis*. Some of them closely resemble Gros Michel and one, I C 1 (formerly called GM × B.2) is resistant to Panama disease. The hybrid does not back cross readily to Gros Michel, although it has abundant pollen. The possibilities of further progress would seem to lie in first generation crosses by other seeded types. The chromosome doubling, to which the close resemblance of the seedlings to the female parent is apparently due, should prove to be a constant feature. A collection of possible male parents is being made to this end. Of the 80 varieties of banana in the collection at the College about half have shown themselves capable of producing seed, and seedlings are being raised from these for further study. The low germination percentage and a proportion of weakly plants among those that do germinate makes progress slow. In the course of the bulletin the technique used in the breeding work is fully described.

86. SKUTCH, A. F. 634.772-1.533.1  
**The nature of sword and water suckers in the banana.**  
*United Fruit Company, Boston, Mass., Research Dept. bull.* 22, 1930, pp. 16,  
 bibl. 4.

The sword sucker is one which produces at first a succession of very slender leaf blades, and it is not till a certain height has been reached that the successive laminae become increasingly broader in outline. Water suckers are those which produce broad leaves at a very early age, and planters have long considered that they are inferior propagating material to the sword



suckers. This point is now under investigation. In examining water suckers it was noticed that the broad leaf sucker was seldom connected with the parent plant by sound tissue but that the slender offset between the two was injured in some way, usually by insect or fungal attack. It was considered that the production of sword or of broad leaves is a matter of correlation between sucker and parent plant. To test this view a series of experiments were made with a variety whose normal suckers produced well marked sword leaves of considerable height. In experiment No. 1, the false stems of the parent plants of 5 mats were cut off, leaving a total of 26 sword suckers between 15 and 54 cm. tall. The result was the prompt production by all the suckers except a few sickly ones of the broad leaves typical of water suckers. In experiment No. 2 young sword suckers were severed from the parent plant by inserting a machete in the ground close to the latter. The controls were unsevered suckers attached to the same plants. Suckers of this age have a very poorly developed root system and are dependent on the parent plant for much of their water supply. In spite of this the immediate effect on the severed suckers was the production of broad leaves in quicker time than that taken by the controls. The leaves were of an intense emerald green in contrast to the yellowish green leaves of the normal suckers, but they reverted to the normal colour as the sucker became established. In experiment No. 3 the growing point of the parent bulb was excised without injury to the mature leaves. Here little difference was observable between the suckers on the experimental and control plants. It is apparent that the growth of the sword sucker is inhibited in some way by the parent plant. Exp. No. 1 showed that the inhibition cannot lie in the bulb. Exp. No. 3 showed that it cannot lie in the growing point, therefore the correlation seems to exist between the leaves of the parent plant and the young sucker. If these leaves, which also form the false stem, are cut away, the inhibition is removed and rapid broad leaf growth of the sucker results. The phenomenon is one of apical dominance, the suppression of the growth of the sucker by the parent plant, of which it is only a branch, being entirely analogous to the suppression of the lateral buds by the terminal bud of the twig of a dicotyledonous tree. The purpose of the delayed leaf development of the sword sucker is, on the analogy of the related *Heliconia*, in which plant the division of labour among the parts is more sharply defined, to provide a support for the leaves when they eventually develop, which will lift them well above the ground and enable them to spread their laminae and to obtain better illumination.

87. COOPER, G. P.

634.772 : 581.162.3

**Laboratory and field studies of the pollens from some varieties of Musa.**

*United Fruit Company, Boston, Mass., Research Dept. bull. 23, 1930, pp. 34.*

This bulletin is the result of studies on the variation in pollen material in different varieties of bananas, carried out in an attempt to ascertain the more promising varieties for breeding work. It is clearly shown that certain varieties cannot be used owing to the failure of the pollen to germinate. Other varieties show fair and very good germination. The germination medium eventually selected was sugar-agar jelly of about 2% shred agar-agar and cane sugar concentrations varying from 5-15%. With the 5% sugar-agar the germinating tubes tended to grow into the medium, with the stiffer 15% concentration the tubes grow flat along the surface and are then in a good position for examination while active and also for staining and location of the nuclei. Variations of the medium were made by the addition of small counts of magnesium sulphate, potassium nitrate, and potassium phosphate, yeast, etc. These variations and the reactions of the pollen to them as well as the whole technique used in the experiments are described in detail. The pollen of the different bananas is here divided into four groups based on the physical characteristics and the germination percentage on artificial cultures. Of these, group A with dry clean uniform pollen, germination 20-90%, and having no pre-germination in the anthers includes the majority of the seeded varieties or 10 varieties out of the 97 recorded here. Group D, germination under 1%, containing 62 varieties, characterized by having moderately scarce or even no pollen, a heavy matrix, and pre-germination within the anthers rare to very

frequent, includes the majority of the edible varieties. Groups B and C, 10 varieties each, are intermediate, having a germination of 5-20% and 1-5% respectively. An appendix gives a description and classification of the pollen of each of the 97 varieties under investigation. Another 50 varieties under investigation are not expected to alter the general findings and conclusions reached so far.

## STORAGE.

88. SUTHERLAND, R. 664.85.13.037  
**Factors influencing the keeping qualities of pears in cool storage.**  
*New Zealand J. Agr.*, 1931, 43: 273-6.

The most favourable climatic conditions during growth of pears destined for cool storage are those that provide a constant growth throughout the season without sudden spurts or checks due to excessively wet or dry weather. Such conditions enable large quantities of food reserves to be stored by the fruit, a condition which prolongs the storage life. The necessity for careful handling during picking is stressed. Fruitgrowers often think that very slight injury is immaterial but it is just these fruit which, distributed throughout a consignment, are responsible for increasing the wastage tenfold. The fruit should reach the cool store as soon as possible after picking, its life being shortened in proportion to the time elapsing between picking and the cooling to the required temperature. Uniform storage with ample air space between the containers is essential to facilitate rapid initial cooling. Uneven cooling is the cause of considerable wastage: precooling before stacking will avoid this. The most successful temperature is 29-32° F., the latter being the maximum. A relative humidity in the store chamber of 83-85 per cent. may be suitable, but this depends on many factors which have to be known and carefully studied, such as climatic conditions during growth, class of container, etc.

89. VICKERY, J. R. 664.85.037  
**Refrigeration applied to the preservation and transport of Australian foodstuffs.**  
**A survey and scheme for research.**

*Commonwealth of Aust. Council Sci. Ind. Res. pamphlet 23*, 1931, pp. 40.

Excessive wastage, amounting in years of greatest export to as much as 63% and 84% of the cargoes, has occurred in shipments to England of Australian apples and pears. It is considered essential that extensive investigations shall be undertaken on three aspects of their storage problem. (1) Orchard conditions, initially cultural practice including rootstocks, manuring, orchard hygiene and maturity at time of picking. (2) Physical conditions of storage, i.e. temperatures, relative humidity, composition of the atmosphere and their relation to storage life. (3) Biochemical studies, starting possibly with a study of the relationships in the fruits between the concentrations of organic and inorganic phosphates and the carbohydrate constituents and the inter-relationships between these factors and storage life. Investigations of *Navel oranges* should be directed to the possibility of extending the storage life by means of gas storage. Further experiments are recommended, in continuation of those conducted in Queensland, for the purpose of finding *grape* varieties which will bear transport overseas and possibly be more in demand than Ohanez. Among others investigated in Queensland were Purple Cornichon, Flame Tokay, Red Malaga, Black Muscat and Waltham Cross. *Passion fruit* investigations started in Victoria have yielded promising results and will be continued. Tindale has shown the necessity for cooling *plums* before shipment and that the optimum storage temperature is 30-32° F. The storage life of *peaches* is too short to warrant at present profitable investigations here. Investigations on *banana* storage by the Council are now approaching completion. Until marketing prospects are better it is not proposed to make any further investigation regarding *pineapples*. The carriage of tropical fruit to the south and of apples and pears from Tasmania to the Northern States needs investigation. It is recommended that two laboratories with cold storage facilities should be set up in Brisbane and Melbourne, the former to study problems of meat export and of the transport of tropical fruits, and the latter to investigate the preservation and transport of non-tropical fruits.

90. RASMUSSEN, L. 664.85.037  
Studien über den Reifungsprozess u. die Haltbarkeit des schwedischen Obstes  
bei der Aufbewahrung im Kühlhause. (The ripening process and keeping  
quality of Swedish fruit in cold store.)

*Angewandte Botanik*, 1931, 13 : 473-525, bibl. 5.

The author gives the results of his investigations at Norrköping in Sweden, macroscopic and microscopic, on a large number of apples and pears and a few grapes of different varieties harvested in 1925, 1926, 1927, and put at once some in cold store, others in ordinary fruit store. Microphotographs are given of the tissues at the beginning and end of storage and details of apparatus and of stains used. Observations were made on the following points in each case :— date of storing, geological formation of orchard, nature of soil close to tree, age of tree whence taken, storage life in ordinary store and recommendation of best date to market, storage life in cold store, colour changes in fruit and in pips during storage, date of occurrence of internal breakdown, recommendations as to best date for marketing, date when last fruit broke down, date of fungal infection. It was found that histological deterioration is first noticeable only at the very end of the storage life. It begins in the loose mesocarp tissue with degeneration and break up of the cells, the denser part of the mesocarp remaining unaltered much longer and showing a different type of degeneration. The stone cells of the mesocarp show very little change. The vascular bundles also show long resistance to degeneration. The epicarp is much more resistant than the mesocarp. The process results finally in necrosis of both tissues. The ripening process was found to be slower but otherwise to follow the same course as under ordinary storage conditions. The bloom remains unchanged. Green fruits change gradually to yellow. No change was noted in red fruits. Nuclei and protoplasm disappeared at the end of the storage life. Epidermis cells showed the utmost resistance to fungal and other attack. Storage life is limited by the effect of enzymes on protoplasm and nuclei, whose destruction brings in its train that of the cell walls. Macroscopically the phenomenon is disclosed as internal breakdown, microscopically as cell degeneration. Histological examination of the fruit shows deterioration before it is apparent, macroscopically. The dates at which breakdown occurred and those recommended for selling are interesting and one would like a little more information as to such a mundane and unscientific matter as flavour, when one sees the date recommended for selling Cox's Orange Pippin as May to June. The exact temperature of storing is not apparently stated. (The writer in correspondence states that the temperature varies from + 1° C. to - 1° C., that the flavour remains unimpaired and that the best date for marketing is April to May.—Ed.)

### PACKING, PROCESSING, FRUIT PRODUCTS.\*

91. FLINTOFF, A. 634.11-1.564  
Standardizing the apple pack.  
*J. Agr. Western Australia*, 1931, 8 : 510-19.

A practical article, adequately illustrated, on the proper packing of apples, including notes on the case itself, the packing bench, packing trolley, cardboard packing, wrapping paper. Details of the application of "counts" and of packs with different layers, e.g. 2-1 × 5, 2-2 × 6, 3-2 × 8 layer packs are given.

92. SHOWELL, H. 664.85.87.047  
A short review of grape drying practice in the River Murray districts.  
*J. Dept. Agr., South Australia*, 1931, 35 : 557-66.

The writer reviews earlier methods and the gradual evolution of modern practices, giving useful hints on current problems. He shows the importance of the condition of the fruit, the type of soil, the influence of dip temperature and time of immersion on colour, the necessity for quick

\* See also 44.



drying and exposure to sun or artificial heat to develop and fix the colour of the finished product. He considers that further investigations are essential on the following points. (1) Cause and prevention of grapes, apparently perfect at dipping, afterwards turning into red or brown "blobs." (2) The best stage of ripeness for picking. (He notes that the fruit of ringed are about a week later than those of unringed vines to gain the same density.) (3) Loss of colour of half-dried grapes during damp weather. (4) Best technique of colour development after drying, especially with view to reduction of costs. (5) Fixation of colour in product for at least 15 months. (6) A method of dipping to improve the skin texture of the raisin.

93. ATKINSON, F. E. 664.85.047 (71)  
**Dehydration of Canadian fruits.**

*Domin. Canada Dept. Agr. bull. 151 (N.S.), 1931, pp. 20.*

Practical notes on the dehydration of apples, apricots, prunes and loganberries. *Ripeness.* Apples should be just fit for eating. Apricots should have developed full colour and flavour. Prunes must be fully mature. Logans should be in as ripe a condition as possible consistent with their transport to the dehydrator, sorting and trayng without loss of juice. *Apples.* The following processes are noted:—washing, grading, paring (this includes peeling, coring and cutting), trayng and sulphuring, dehydrating, curing and grading to suit the regulations. It is noted that dehydration does not depress the nutritive value of apples as does evaporation. *Prunes.* Dipping for 2-4 seconds in a 1½% solution of lye, dehydration, curing and packing. A note is given on trials of different varieties and their suitability. *Apricots.* Cutting, trayng, sulphuring and actual dehydration are shortly described. Dehydration and sun drying are compared. The necessity for determining the proper amount of sulphur dioxide—which incidentally helps to retain not only colour but vitamin C—is stressed. It is suggested that dehydration may only be profitable in years of bumper crops. Diagrams and descriptions are given of dehydrator construction and of the trays and cars used.

94. BECKLEY, V. A. 668.52  
**Essential oils. The methods of production and their possibilities in Kenya Colony.**

*Kenya Dept. Agr. bull. 19, 1931, pp. 25.*

The bulletin discusses methods of production of essential oils and the possibilities of their commercial exploitation in Kenya. Intending planters are warned in the preface of the need for caution in taking up crops of this kind, since the market is uncertain and conservative, and, except for the geranium plantations of Njoro, nothing is known of the suitability of different districts for the culture of various essential oil plants. Several kinds of still are described and a short account given of the theory and technique of distillation. Indigenous plants do not provide much hope of commercial distillation, since the oils they produce are either very similar to other oils already more cheaply produced elsewhere or they are unpleasant. The most promising is perhaps East African cedar (*Juniperus procera*). The oil is being used in increasing quantities for perfuming soaps and as a fixative of other perfumes in soap. It is being used at present only by a small clientèle, who apparently have not divulged its origin or nature. This oil can be obtained from sawdust and shavings which, being waste products, would make it a profitable oil to produce even at a low price. Of exotic plants geranium oil is already being produced in Kenya from *Pelargonium graveolens*. The oil is low in esters and has a peculiar odour and therefore fetches but a low price. It is thought that the low ester may be merely a varietal peculiarity. Other pelargoniums of known value for the purpose are being introduced and tested by the Department of Agriculture, and the best will eventually be distributed. The local variety of Lemon grass (*Cymbopogon citratus*) produces an oil which has been favourably reported on by London oil brokers, who valued it at about 2/- per lb. The East Indian variety is being imported for trial, since the oil is more soluble in alcohol. It remains to be seen, however, whether the odour value is as good as that of the local variety. Two eucalypts were examined,

*Eucalyptus globulus* and *E. citriodora*; both gave a substantially higher yield than that recorded for Australia where they are grown commercially. It is concluded that Kenya would be well suited to produce eucalyptus oils. Other varieties commercially grown elsewhere such as *E. Australiana* and *E. Smithii* should be introduced. Peppermint (*Mentha piperita*) will succeed at elevations over 6,500 ft. A sample prepared from the Mitcham variety grown at Molo was very favourably reported on in 1915. There is no peppermint oil now produced in Kenya, but it is almost certain that it could be profitably grown. Lavender is a doubtful crop at present. Full instructions for cultivating each of the plants mentioned are given.

## NOTES ON REPORTS.

95. WYE. 63(072)(05)  
**Journal of the South-Eastern Agricultural College**, Wye, Kent,  
 No. 29, 1932, pp. 63.

In issuing this number the editor states that it is now proposed to publish one number in January, which will be in the nature of a general report of work in progress, and a second in July, which will be devoted mainly to original papers. Under the entomological section observations are made on the incidence of horticultural pests in 1931 and on investigations at present in progress, especially on the bionomics and control of capsid bug. Mycological research embraces the following:—Downy mildew of the hop (*Pseudoperonospora humuli*), apple scab (*Venturia inaequalis*), spraying, immunity of the hop to "mould"=mildew (*Sphaerotheca humuli*), virus diseases of the hop, hop canker (*Fusarium* sp.), hop mildew fungicides, lavender blossom wilt (*Botrytis cinerea* sp.), mushroom cultivation and diseases. The hop experiments in progress are detailed. There is much of interest to fruit growers in the reports of the Chemistry Department on spraying trials and fruit soil survey and on the work carried on in co-operation with the Research Entomological Department on insecticides and fungicides. The report of the Botanical Department notes Pearl's studies during the last 5 years on the characteristics of some 60 apple varieties at flowering time, an account of which is to be published shortly. Each section concludes with a useful list of recent publications by members of the different departments.

96. NEW ZEALAND. 63(931)(058)  
**Annual Rept. Dept. of Agriculture for 1930-31**, Wellington, 1931,  
 pp. 57.

Among points brought out in the Report of the Horticultural Division (pp. 23-26) are the following:—The retarded ripening owing to lack of sunshine and consequent smallness of fruit of the tomato crop; the temporary bad effects of spring frosts on the citrus crop; the purchase of 20 acres of established fruit trees for the setting up of a Central Fruit Research Station at Redwood's Valley; 1930 fruit exports; local marketing of fruit; fruit storage investigations. Successful trial was made of transporting fruit from coast boats and cool stores to holds by the loaded tray system. Other investigations were undertaken on precooling fruit prior to shipping and on the early reduction of temperatures in ship's holds. Liaison work with the Palmerston North Plant Research Station is noted, as also the progress of experiments with tung oil plants grown from imported seed, and rootstock investigations on deciduous and citrus fruit trees. In the Report of the Palmerston North Plant Research Station (pp. 31-50) it is noted that government orchard instructors are co-operating in manurial experiments on pome fruits at Auckland, Hawke's Bay and Otago, on stone fruits at Auckland and on citrus at Tauranga. The chief basic aim of these experiments is to discover "To what extent  $P_2O_6$ ,  $K_2O$  and N are limiting production in these districts." The mycologists are watching the experiments for any indications of resistance to fungus diseases. The experiments are laid out with 5 replications in the form of a Latin Square or in a form varying only slightly from this system. The mycologists are also investigating fire blight (*B. amylovorus*), various cool store rots, lemon bark blotch. The latter has now been identified as *Aschochyta corticola* and control measures recommended have proved successful.

97. NEW ZEALAND.

634/5(931)(058)

**Report of Dept. of Scientific and Industrial Research for 1931,**  
pp. 64.

Contains certain information of interest to this Bureau. P. 5—*Phormium tenax* = New Zealand Flax. Research at the Massey Agr. College has led to definite information regarding improved varieties and the conditions necessary for profitable culture. Investigations have been made on methods of bleaching the fibre, and tests of the paper making qualities of the flax have been made in co-operation with the Bureau of Standards in the United States, who published the results. P. 9—*Fruit Research*. An experimental orchard of 29 acres has been started at Appleby, Nelson. The work is to be associated with investigations carried out at Cawthron Institute, at the Plant Research Station and with the field work of the Dept. of Agriculture. The programme already partly begun deals with rootstocks, manurial and cultural methods, pest and disease control, and cold storage trials. At Cawthron Institute the best range of temperature and humidity in cold storage for each variety of apple is steadily being revealed. In packing experiments the adoption of all round wraps, using corrugated cardboard linings in ordinary fruit cases, reduced the amount of bruising. For bananas from Nina and Samoa it has been found that the best humidity to ensure ripening without mould-growth is 80 per cent., the best temperature being 64-72° F. (H. A., 1931, 1:4:411). An addition of 1 part in 2,000 of coal gas or acetylene to the air in the ripening room ensured a better colour and better ripening. The banana experiments are still awaiting confirmation on a larger scale. P. 35—*Citrus*. The citrus survey on rootstocks imported and worked with buds of selected varieties likely to prove successful under New Zealand conditions has been continued. The new stocks have now been planted out in tried areas at selected points in the Auckland Province.

98. BERLIN-DAHLEM.

634/5(43)(058)

Bericht der Lehr- u. Forschungsanstalt für Gartenbau in Berlin-Dahlem 1930.

**(Report of the horticultural research station at Berlin-Dahlem for 1930.)***Landwirtschaftliche Jahrbücher*, 1931, Bd. 74, Ergänzungsband 1, pp. 303-72.

Short reports of the different sections are given in turn. In the account given by the Fruit Products section are notes on trials of chromium plating on vessels used for jam making; the preparation of sweetened sugar-free juices for diabetics; the preparation of low alcohol fruit wines. The experiments of the Physiology section on the effect of planting tulip bulbs at 10, 12, 14, 16 and 18 cm. deep did not show any influence of depth on colour of flowers or time of flowering. The experiments on vegetative propagation by the help of wire rings are being continued and include rose and apple stocks. A note is given on the breeding experiments with apples, pears and peaches. The tabulated figures are said to be available to those interested. A section deals with the following pests and diseases:—*Aphelenchus olesistus*, *Heterodera radiculicola* in the greenhouse, chrysanthemum eelworms, rose diseases and the curative effect of lime, *Grapthium ulmi*, *Carpocapsa pomonella* and *Venturia* sp. and their control by a combination spray, *Mycogone perniciosa* in mushrooms, *Pestalozzia Guepini* in rhododendrons. Trials were also made of different brands of carbolineum, grease banding and various entomological weapons. Experiments at this Station with ethylene indicate the possibility of hastening the ripe appearance and taste of yellow apples by exposure for a week to this gas at a temperature of 64.4-68° F. though no effect was noticeable at 35.6° F. Pears on the other hand (Edel Krassane and Olivier de Serres), at a temperature of 35.6 and a relative atmospheric humidity of 90%, ripened fully under ethylene treatment in a fortnight. Experiments are in progress on the possibilities of cool storing strawberries in the presence of different gases. The preparation of unfermented fruit juices is being examined and includes the trial of many new mechanical devices. A report on the experimental fields at Groszbeeren is presented. It includes data on the following trials:—Tomato varieties; cucumber varieties; peas; winter lettuce; bulb varieties and treatments; rose varieties on different rootstocks, i.e. *R. canina*, *R. rubiginosa*, *R. canina* Senfi, *R. laxa*; mulch paper—results on a moist soil with celery, cabbage, tomatoes, cucumbers, strawberries, lettuce and asters were economically good; comparative values of different forms of potassic



and phosphatic fertilizers on vegetables and of the addition to them of Nitrophoska. It is noted that a similar experiment is in progress on bush trees of Ernst Bosche apples, on which a report will be given later. The above are field experiments. Pot fertilizer experiments on a number of vegetables are also in progress. The report includes lists of publications on experiments in progress already issued, most of them being in periodicals.

99. GEISENHEIM AM RHEIN. 634.8 + 634/5(43)(058)  
 Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu  
 Geisenheim a. Rh. für das Rechnungsjahr 1930. (**Report of the viticultural and  
 horticultural research station at Geisenheim for 1930.**)  
*Landwirtschaftliche Jahrbücher*, 1931, Bd. 74, Ergänzungsband 1, pp. 381-441.  
 (Also published separately.)

*Vines.* Among investigations, of which the chief results are shortly set out, are the following:—  
 Hot water treatment of rootstocks before grafting. After trials of 101/4, 3309 and 5BB root-  
 stocks with Rhine Riesling scions, the recommendation is made that the immersion of these  
 rootstocks for 6 hours in water at 102° F. immediately prior to grafting is likely to lead to stronger  
 callusing and better growth. The effect of tobacco extracts, crude nicotine and cotton oil  
 soap solution on ripening of grapes. Nicotine was found not to hinder ripening. Striking  
 grafted cuttings (1) in sand, (2) in the field after treatment with calcium sulphate according to  
 Bunert's method. The latter gave most promise. Both investigations are being continued.  
 The breeding section is working in close touch with the Kaiser Wilhelm Institut in Müncheberg.  
 Attention in the plant pathology section has been devoted to:—Raising seedlings resistant  
 or immune to *Plasmopara viticola* and *Oidium Tuckeri*. It would appear that certain individuals  
 of the F2 generation of Riparia × Rupestris are immune to the former; the strawberry weevil  
*Anthonomus rubi*. In this connection another weevil was found also to be doing considerable  
 damage, namely *Rhynchites germanicus* Hbst. (= *Rh. minutus*). Apparently the leaves are  
 chiefly attacked by the latter. The fruit products section has been conducting experiments  
 on:—the cool storage of fruit juice; methods of determining pectin substances possessing  
 strong jellying properties; the heightening of the filtration capacity by fermentation with  
*Aspergillus oryzae*; the uses of *Citrus trifoliata* fruits; a new method of preventing mould  
 formation on jams. Interesting breeding experiments on silkworms from different sources  
 are in progress, though it is noted that under present conditions there would not appear to be  
 much future for this industry even as a side line in Germany. Experiments on vegetables  
 seem to have been mainly variety trials. Notes and recommendations are made for a number  
 of ornamentals. Notes appear on the effect of different types of pruning, of the length and  
 wood quality of stocks used for grafting and of different rootstocks on growth and callusing.  
 Lists of publications dealing with these and other experiments at the Station are also given.

100. FAES, H. 634.1/5 + 634.8(494)  
*Rapport Annuel de la Station fédérale d'essais viticoles à Lausanne et Domaine  
 de Pully 1930. (Annual Report of the Federal Viticultural Research Station,  
 Lausanne.)* (Reprinted from *L'Annuaire agricole de la Suisse*, 1931), pp.  
 273-310.

A general survey of the Station's work, which has in many cases been published at greater length  
 elsewhere. *Rootstocks.* Riparia × Rupestris 3309 has been found pre-eminently suitable for  
 light, medium and heavy soils which are not strongly calcareous. For heavier soils still poor in  
 lime Rip. × Rup. 11F. is recommended, or in the case of wet subsoils Rip. × Rup. 3306 and  
 Solonis × Rip. 1616. In soils containing large amounts of fairly available lime the following  
 are successful:—Chasselas × Berlandieri 41 B, Cabernet × Berl. 333, Berl. × Rip. 157<sup>11</sup>,  
 Teleki 161<sup>49</sup>, Mourvèdre × Rup. 1202. Experiments are being continued with direct producers,  
 training systems, fertilizers, mechanization, removal of spray residue from table grapes. Notes  
 are given on the spread of phylloxera, on treatment of *Peronospora viticola*, on the life and powers  
 of survival of *Coniothyrium diploidiella*. Figures are given from Pully of returns from vines

planted, pruned and trained variously. The quality of yield has been little affected whether the rows were 1.10 or 1.20 metres apart ; the largest yield came, however, where 0.90 m. rather than 0.70 or 0.80 m. was the distance between vines in the rows. As regards pruning the long bearer method gave much the largest yield, a yield combined, however, with the lowest reaction to the Oechsle test. There was little to choose between the two other systems tried over 5 years, i.e. the goblet and cordon systems, both of which gave a higher Oechsle reaction and a lower yield. A further experiment indicated that with Chasselas, under their conditions, the production from scions taken from the base of the vine shoot is greater than that from scions taken higher up. Further from Pully it is noted that a trial of the Fischer grafting machine is to be made, although the Hengl still continues to give satisfaction. Walnut grafting experiments have been successfully continued. It is noted that scions must be absolutely in proper condition (i.e. with as little pith as possible.—ED.). This entails the partial or total cutting back of a tree to give suitable young shoots, a process which involves the loss of crop on that portion. The stock must be prepared some weeks before grafting, to avoid excessive bleeding. Osier growing is also receiving attention. An investigation on cherry varieties grown in French Switzerland is to be undertaken on the lines of those completed on pears and apples. A report on " Delayed Scab " (tavelure tardive) (*Venturia inaequalis*) has been published separately in the *Annuaire Agricole de la Suisse* for 1931 (also reprints). Certain apple varieties show a tendency to develop characteristic scab marks in store, although at the time of picking and storing no such marks have been evident. Lists of publications in 1930 are given. The report of the division of chemistry and bacteriology mainly concerns wine making problems.



**SHORT ABSTRACTS OF THE FOLLOWING ARE ALSO AVAILABLE:**

- ANON. **A national mark cider farm.** *J. Min. Agr.*, 1932, 38 : 1018-20.
- CONNARD, MARY H., AND ZIMMERMANN, P. W. **The origin of adventitious roots in cuttings of *Portulaca oleracea* L. (Purslane).** *Contrib. Boyce Thompson Inst.*, 1931, 3 : 337-46, bibl. 2.
- SHEWELL-COOPER, W. E. **Fruit growing in Cheshire.** *J. Min. Agr.*, 1932, 38 : 1101-8.
- DEVON COUNTY AGRICULTURAL COMMITTEE. *Report on trials and experiments carried out on fruit, flowers and vegetables at the Tamar Valley Horticultural Experiment and Demonstration Station, Bere Alston, 1926-30*, pp. 47.
- "FORMAKIN." **On planting.** *Gard. Chron.*, 1931, 91 : 64.
- GOKHALE, V. N. **Preparation of manure from plantain stems.** *Poona Agr. Coll. Mag.*, 1931, 23 : 184-7.
- LLOYD, J. W. **Fertilizing tomatoes, sweet corn and muskmelons in a three year rotation.** *Univ. Illinois Agr. Exp. Sta. bull.* 364, 1931, pp. 18.
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- MILLER, M. ETHELWYN. **Natural grafting in *Hedera Helix*.** *New Phytologist*, 1932, 31 : 2-25, bibl. 6.
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- DE VILMORIN, P. **Travaux récents sur la culture du cotonnier dans les colonies anglaises. (Recent work on cotton in the English colonies.)** *Rev. Bot. Appl.*, 1931, 11 : 961-9, bibl. 8.
- ZIMMERMANN, P. W., AND OTHERS. **The effect of ethylene and illuminating gas on roses.** *Contrib. Boyce Thompson Inst.*, 1931, 3 : 459-81, bibl. 8.



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